Library
SEP 8 1924

CHEMICAL & METALLURGICAL ENGINEERING

McGraw-Hill Co. Inc. | September 8, 1924 | 25 cents per copy

Known for Durability and Dependable Service

Usually, when you see an especially fine refrigerating coil or bend installation, you will find that it has been turned out by Harrisburg.

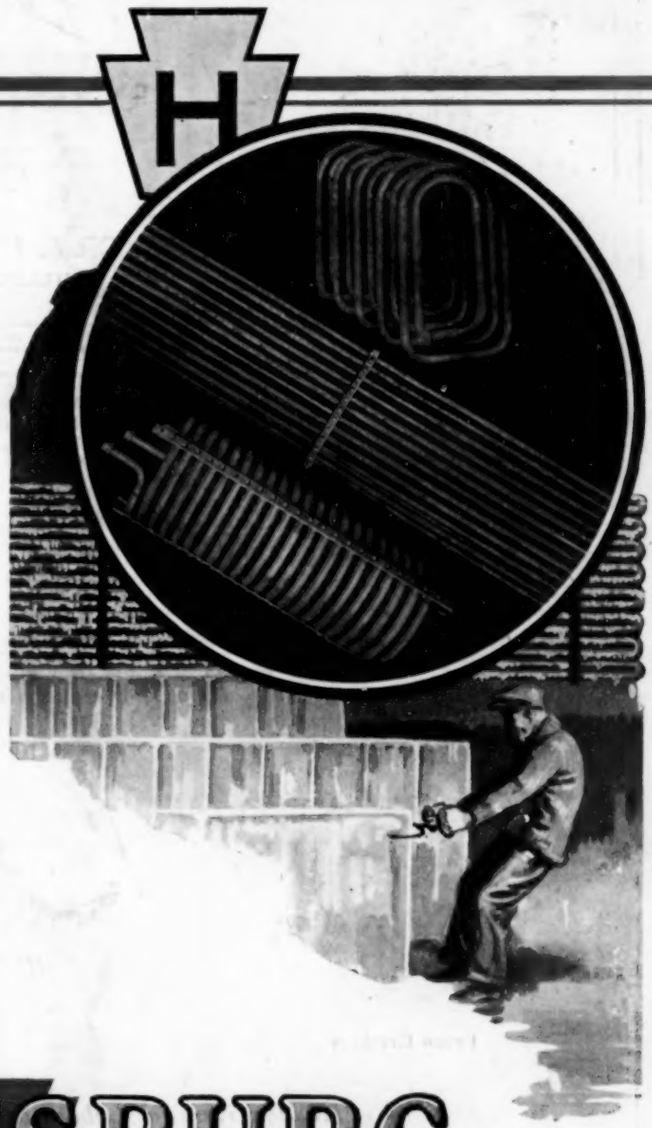
But while we have yet to find a coil or bend problem too difficult to handle in our plant, we are prouder of the fact that all of the installations we have produced in over 30 years' experience have upheld the Harrisburg reputation for dependable and durable service.

Remarkable producing facilities, splendid workmanship, rigid tests and painstaking inspections combine to place Harrisburg service far above the ordinary. Whatever your requirements, we can handle them promptly and with surprising economy. Consult our engineers.

Our booklet "Coils and Bends" is well worth writing for

HARRISBURG PIPE & PIPE BENDING CO.
HARRISBURG, PA.

Also makers of Alloy Steels in Slabs, Billets, Bars, Skelp, Strips and Shapes



HARRISBURG
COILS and BENDS

Our catalog will be sent on request. Our service department will make recommendations without obligation.

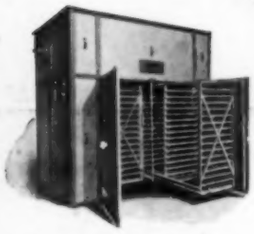
We assume full responsibility

From rough casting to the final file finish. Shriver Filter Presses are made in our own factory. Our reputation as foundrymen of exceptional merit goes back to 1860. The quality of Shriver Filter Presses is the result of a knowledge and experience in foundry work combined with a thorough knowledge of filter press design and practice gained by experience.

T. SHRIVER & CO.
808 Hamilton Street, Harrison, N. J.

The filter medium is just as important as the Filter Press. We sell specially woven filter cloths and filter paper at very close prices. We shall be glad to quote on your requirements.

DRYING MACHINERY



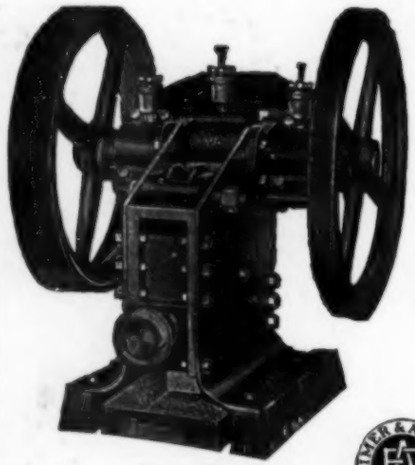
Truck Type Dryer for Chemicals, Colors, etc.

PROCTOR & SCHWARTZ, INC.
PHILADELPHIA.

Cabinet Tray Dryer for Pharmaceuticals, Chemicals, Colors, etc.

Braun Crushers, Grinders, Furnaces, Gasoline Burners

and other forms of laboratory apparatus



Braun Crushers

We are Eastern Agents for the widely used Braun Apparatus.

The different sizes of the Chipmunk Crusher are the most satisfactory for crushing rock and coal down to 20 mesh.

The Braun Disc Pulverizer is intended to be used with a crusher to reduce to 100 or 200 mesh.

The coal grinders are used especially to prepare coal specimens for calorimetric tests.

The furnaces are muffle, crucible and combination for heating by gasoline or gas.

Burners are supplied for gasoline or gas, also for kerosene, with suitable tanks and blowers.

Write for Catalog pages stating your requirements

EIMER & AMEND

ESTABLISHED 1851

Headquarters for Laboratory Apparatus and Chemicals

200 East 19th St., New York City, N. Y.

WASHINGTON, D. C.—*Display Room*
Suite 601, Evening Star Bldg.

PITTSBURGH AGENT
4048 Franklin Road, N.S.

CHEMICAL & METALLURGICAL ENGINEERING

McGRAW-HILL COMPANY, INC.
JAMES H. McGRAW, *President*
E. J. MEHREN, *Vice-President*

H. C. PARMELEE
Editor

Volume 31 — New York, September 8, 1924 — Number 10

What European Settlement Holds for American Business

SECRETARY MELLON returned last week from Europe satisfied, according to newspaper reports, that "the adoption of the Dawes plan has cleared the path for the economic revival of Europe." This encouraging comment comes as a welcome confirmation of other developments that are daily being reflected in American business. Increased confidence in the foreign exchanges would seem to indicate that at last European settlement is definitely on its way.

On Aug. 16, when the conference of allied premiers in London reached the agreement for putting the Dawes plan into effect, a number of issues were yet to be decided. This was but natural, for any scheme, no matter how carefully drawn, has to deal with many future uncertainties—economic as well as political. Nowhere do we find a precedent for the payment of such huge sums as this plan calls for. Nor when these payments are made is it possible for us to foresee their effect on the industries of the world. Difficulties that the theoretical economist can dispose of with ease are, and will continue to be, the subject of apprehension among many practical men of business. It is easy to say, for instance, that Germany must export in order to pay; must increase the outgo and lessen the intake; produce more and consume less. But to enforce such a program under existing conditions will be a real problem for Germany. Furthermore, this increased production must be absorbed by the rest of the world. The economist points out that properly balanced production can be consumed almost without limit, for its consumption means merely moving up a notch or two in our standards of living. It is overproduction in one direction and underproduction in another that causes economic disturbance. Business men are asking if it will be possible to control Germany's output—to maintain the delicate equilibrium that means the difference between prosperity and panic.

To some extent this control may come through financial direction. Germany is badly in need of capital and must offer inducements to attract it. Something more than high interest rates will be necessary in a country where taxes are almost confiscatory and industry is facing serious labor troubles brought about by socialistic agitation. It is conceivable, therefore, that those who make the loans will take a hand in shaping the course of German enterprise.

Doubtless the future holds many other problems that may prove equally serious. But it is certain that with European settlement definitely on its way, American business will receive a real stimulus. Reparation payments will mean increased purchasing power. There will be a greater movement of raw materials to Germany and a more active, even though more competitive, market for manufactured goods. Most beneficial, however, is the fact that readjustment means economic recovery—the return to normal—"Good business, as usual, at home and abroad."

Interpretation of Scientific Fact

THE TRUTH often needs scientific interpretation. To chronicle it merely because it appears to give color to preconceived notions is a dangerous if not an immoral practice, especially when the fact refers to the results of scientific research and when the chronicling is done by one unfamiliar with the processes of scientific analysis. Henry Ford is opposed to the gold standard. His organ, the Dearborn *Independent*, recently made editorial matter out of the report from Germany that Prof. A. Miethe had succeeded in transmuting quicksilver into weighable quantities of gold. It may have been too trivial a matter for comment in Dearborn, but the fact remains that the cost of manufacture was estimated at about $300 per grain of gold produced. The conclusion reached by our contemporary was: "If and when gold is produced in quantities by scientific process, the economic idol known as the gold standard will speedily topple over. Already, as John Maynard Keynes declares, the gold standard is 'as dead as mutton.' To science may fall the honor of digging its grave."

Science promises nothing, anticipates nothing, in the direction of the highly improbable. That eminent scientist, Frederick Soddy, a few years ago gave a simple recipe for the transformation of mercury into gold—a metal that has always been the goal of the alchemist and which is followed in the periodic table by mercury, thallium, lead and bismuth. To obtain gold from mercury, all that is needed is to expel from the atom of mercury one beta particle, which will make an element that is an isotope of thallium, then one alpha particle, which will turn the thallium into gold. The scientific fact overlooked by the *Independent* is that the changing of a base metal into gold, for the sake of the gold, is beyond scientific vision. The energy needed would far exceed in economic value the worth of the product. The alternative, the transmutation of gold into base metal, is more probable. Mercury often contains a minute amount of gold. It may be that Professor Miethe's experiment was one of mechanical separation.

The production of gold in quantity by scientific transmutation could affect only the pocketbook of some multi-billionaire who was willing to exploit the venture. It is impossible to conceive that it could have any appreciable effect on the gold standard.

The Potash Pact And Our Economic Defense

ON AUG. 27 the German Potash Syndicate and the Société Commerciale des Potasses de l'Alsace signed a revised agreement whereby the American market for potash was apportioned 62.5 per cent to the German and 37.5 per cent to the French companies. This agreement, which resulted from the fourth effort on the part of the French to reach an understanding, is by no means final, for many details regarding the distribution of the various grades of fertilizer and industrial salts are still the subject of negotiation. Sufficient has been accomplished, however, to show that the arrangement brings with it no good for the American purchasers of potash. It is evident that they now find themselves confronted by a single foreign agency made up of two national groups instead of two competing interests. No longer will there be an opportunity to gain price advantages from the one or the other, nor is there much hope of bettering conditions of supply and delivery.

The gravity of the situation has been recognized by the Department of Commerce, and Secretary Hoover has authorized a survey along the lines of those already made of various other foreign monopolies of essential raw materials. Just what the official investigation will disclose is at present a matter of conjecture, but it is certain that some thought will be given to the several means at hand for combating the situation. The weapon likely to prove most effective would be a law permitting importers to combine for the purpose of purchasing raw materials controlled abroad. Precedent for such an arrangement is found in the Webb-Pomerene act, which authorized combination of manufacturers engaged in exporting American goods to foreign markets. This policy has been openly advocated by the department in a number of instances and it is confidently believed that just such a situation as now confronts the fertilizer producer and user is all that is necessary to drive home to Congress the necessity for authorizing this important means of economic defense.

Appeal for an "Even Break" With His Competitors

IN WRITING about recent articles in *Chem. & Met.* on the use of oil and electricity for industrial heating, a representative of one of the largest gas companies in the country asked the question, "At any rate cannot the gas industry have at least an 'even break' with the electric or oil people?" Direct answer to this correspondent has, we hope, satisfied him that *Chem. & Met.* is not partisan in favor of oil or electricity. Hence there would be little point in further comment on the situation except that there is a lesson in it for other industries.

The substance of the answer to our correspondent was that the editorial staff of *Chem. & Met.* found it practically impossible to get from the gas industry the technical material needed for adequate editorial treatment of gas for industrial heating. The man who complained is the one outstanding example in the industry where the editors have had regular and cordial co-operation. Unfortunately, however, he stands almost alone.

Chem. & Met. knows that the industries to which it is addressed use annually almost a hundred billion cubic feet of city gas for heating. This fact alone would justify careful attention to gas-making and gas-using methods and equipment. But the editors alone cannot work successfully in bringing out the facts. The leading men in the industry must co-operate in furnishing the data and descriptive material that should go abroad to all the gas-consuming industries.

We wonder if there are not many other industries that depend upon the pages of *Chem. & Met.* for technical information and advice, which are suffering unnecessarily because they fail to do their part. It will be well for industrial leaders to consider whether user industries are without needed technical information largely because proper attention has not been given to publicity on important industrial developments. The readers and the editors of *Chem. & Met.* will do their part to use all the good material offered; but neither editors nor readers can make the news or do the industrial work that must be at the basis of technical reports describing progress in the industries.

Empirical Basis of The Metric System

AS WE gain in experience, the shock accompanying the discovery of flaws in earlier ideals lessens in intensity, but with most of us it never entirely disappears. Those of us who studied chemistry will recall the thrill of accomplishment upon having mastered the fundamental gas laws. We believed in them and when we found later that they could not be applied without empirical correction, our faith in such generalizations was sadly shaken. The young engineer, on the other hand, has an advantage in that he is quickly confronted with the problems of compressed air and steam and is consequently not allowed to dwell at length on the "perfect" gases. But consideration of these examples was really prompted by a recent discussion as to why there should be any difference between a cubic centimeter and a milliliter.

Here again the question hinges on an ideal, a decimal system of weights and measures in which the units of volume and mass were to be derived from a single unit of length, the meter, defined as one ten-millionth part of the earth's quadrant. Such a rational and simple relationship among the various units did not exist in any other system. Unfortunately, the reduction of the ideal to tangible and comparable standards has, as is so often the case, involved a sacrifice of some of the original proposals. For a long time the meter has not been the one ten-millionth part of the earth's quadrant, but is merely a unit of length equivalent to the distance between the defining lines on the international prototype meter at the International Bureau of Weights and Measures when this standard is at 0 deg. C.

Similarly, on the original hypothesis, the kilogram was to be the mass of a cubic decimeter, or liter, of pure water at the temperature of its maximum density. The exact determination of this apparently simple relation is, however, one of the most delicate problems in the domain of the physical sciences. Prior to 1799, Lefèvre-Gineau and Fabbroni, by order of the Commission des Poids et Mesures, constructed the first kilogram, but lack of a detailed account of their procedure led investigators in other countries to make independent determinations. The metric convention at Paris in 1872 was confronted with a series of discordant results and no basis for making a choice among them was available. Several delegates were in favor of appointing a com-

mittee to construct a new kilogram from new data, but it was finally decided to define the kilogram as a unit of mass equivalent to the mass of the prototype kilogram and the liter as a unit of capacity equivalent to the volume occupied by the mass of 1 kg. of water at its maximum density and 760 mm.

This resolution destroyed the ideal relationship originally proposed and substituted two arbitrary and independent standards instead of the one postulated by the founders. Further confusion is introduced by the fact that from each of the primary standards is derived a volume unit. The cubic decimeter and the liter are accordingly now based on unrelated standards and the conversion factor was not determined until 1910, when it was established from data obtained by three different methods that the volume of 1 kg. of pure water was 1.000027 cu.dm., or that the mass of 1 cu.dm. of water was 0.999973 kg.

Although the difference is so slight that it may be neglected for ordinary work, we feel that there should be wider recognition of the fact that the metric system as used is actually on just as arbitrary a basis as any of the other systems of weights and measures. There remains, however, the decimal feature, which is the most important advantage of the system and the real reason for its extended use.

Sterilizing Foodstuffs And the Ripe-Olive Industry

OCCASIONAL poisoning by well-known foods attracts little attention. A single instance with a new food is almost sufficient to wreck an adolescent industry. The pickling and canning of ripe olives is a comparatively recent development; the need for adequate provision against bacterial infection has been recognized. Canned olives are sterilized in batches, temperature and time records of which are kept for the inspection of the state food officials. One firm has held aloof from other producers, who voluntarily agreed among themselves to mark every can with a batch number, to correspond with the temperature-control charts. It would seem advisable that records at all olive-canning plants should be kept for inspection, and the batch numbering of cans adopted throughout the industry, so that the cause of defect could be traced. No one can blaze a trail and hide his tracks. The pioneer is justly entitled to preferential consideration; but if he isolates himself from those who follow in his footsteps, he alone suffers from the disadvantages that arise from a lack of co-operation.

There would seem to be scope for a more precise engineering control in these operations, as well as in others of a similar nature. The sterilizer—known as a retort, a term that robs the operation of its significance and importance as an insurance against botulism—is an iron cylinder, in which the closed cans of olives are heated by steam under pressure to the required temperature for the required time. It is more than probable that the temperature as recorded in some plants is not always representative of the heat available in all parts of the sterilizer. It is certain that the cooking given the olives varies according to the size of the container. Too high a temperature softens and spoils the fruit, especially if it be of a certain variety; too low a temperature involves a hazard to the buyer. It is to be hoped that the channel between this Scylla and Charybdis will be widened with a broad margin of safety as a result of research, and by the adoption of positive methods of control that inspire confidence. Although maximum temperature reached in the middle of a can of foodstuffs can be determined with accuracy, no handy instrument is available for checking the duration of sterilization at this temperature—an important factor. There would seem to be opportunity for invention in this connection.

Further, three varieties of ripe olives are canned. Some of these are of large size and consequently in demand; but it is possible that sterilization regulations with a normal factor of safety for large olives would have involved injury to the smaller fruit. Conversely, sterilization regulations with a normal safety factor with the smaller fruit might have proved inadequate if applied to the larger olives. Separate regulations for each type of olive would appear impracticable of enforcement without danger of accident or evasion. The problem has been met by modifying the pickling process in such a manner as to increase the resistance of olives of all sizes to injury by high temperatures. Safety regulations involving adequate time and temperature sterilization are now enforced by the California State Board of Health.

Excellent work has been done at the Agricultural Experimental Station of the University of California on the technology of ripe-olive canning, and by the George William Hooper Foundation and the Stanford University Medical School on the destruction of *Bacillus botulinus* spores by heat; and packers should realize that continued biochemical and bacteriological research, and co-operation in the enforcement of regulations that may seem drastic, are essential to uninterrupted industrial success.

Carbon Monoxide Poisoning From City Gas Supplies

SPORADICALLY there is, in this country, agitation for limiting the amount of carbon monoxide in city gas. This has never taken on serious proportions and probably never will, for it seems to be a well-established fact that very slight, if any, increase in hazard results from distribution of water gas with 25 or 30 per cent carbon monoxide as compared with coal gas containing only 8 or 10 per cent of this toxic constituent.

The recent agitation in Great Britain along these lines has resulted in an important report to the British Board of Trade. This undertakes to correlate the number of cases of gas poisoning with several other factors: The extent to which city gas is used, the number of prepayment meters, the size of the city, the number of premises supplied with gas, etc. Whether or not the conclusions are applicable to American conditions, the American gas industry will doubtless profit by a study of this report.

But the main point for the consideration of the gas-manufacturing company and the industrial works using city gas or other fuel-gas supply is that many more cases of carbon monoxide poisoning result from the products of incomplete combustion than from leakage of unburned gas. In any case where fuel gas is used care must be taken to insure complete combustion and proper elimination of products of combustion. This is quite as necessary with gas as with oil or coal. Not only safety to life but efficiency in plant operation demands careful control of gas-burning devices.

Gums and Resins of Latin America

Chicle, Elemi, Manjak and Many Other Materials of Considerable Industrial Importance Are Available but Await Commercial Exploitation

By Otto Wilson
Former Chief, Latin-American Division, Department of Commerce

LATIN America's contributions to the world's supply of raw materials for paints and varnishes, in the shape of gums, resins, pigments, etc., are still largely potential. This country, for instance, imported in 1922 over $30,000,000 worth of "gums, resins, and balsams," of which more than half were varnish gums and resins. Yet under the latter classification just 330 lb. came from Latin America, and of all the materials listed under the broader heading very few of those from the countries to the south of us, comprising altogether about $5,000,000 worth, found their way into the paint and varnish industry. Latin America's wealth in such materials is largely unexplored. The channels by which we get our needed supplies of this kind from Europe and the East are well worn, and exploitation of sources nearer home must wait until facilities are such that they can be obtained at lower costs than we now pay.

The chief gum which comes to us from the forests of Latin America and the only one imported in any considerable quantity has nothing to do with paints or varnishes. (Rubber and balata are sometimes called gums, but the use of the term is loose and inaccurate.) This is chicle, the base of chewing gum. As illustrating how the chewing gum habit has grown in this country, the progressive increase in imports of chicle since the beginning of the century is of interest:

Fiscal Year	Lb.	Fiscal Year	Lb.
1900	2,298,000	1912	7,782,000
1901	3,141,000	1913	13,759,000
1902	4,575,000	1914	8,041,000
1903	4,282,000	1915	6,500,000
1904	5,0[illegible]5,000	1916	7,347,00[illegible]
1905	5,060,000	1917	7,440,000
1906	5,642,000	1918	6,408,000
1907	6,733,000	1919	8,345,000
1908	6,090,000	1920	9,700,000
1909	5,450,000	1921	8,710,000
1910	6,794,000	1922	8,283,000
1911	6,508,000	1923	9,125,000

As these figures show, we are now using four times as much chicle as in 1900, practically all of it going into chewing gum. Its import value averages around 50 cents per pound. As it comes from the producing countries of tropical America it contains about 40 per cent water, and prior to 1913 importers found it profitable to bring it into New York in bond, reship it to Canada, dry it out, and bring it back into this country, thus avoiding payment of duty on nearly half the weight. But in 1913 Congress put the duty on refined or dried chicle at 20 cents per pound as compared with 15 cents on crude, and this has served to cut down the imports from Canada, which formerly represented a large part of our total imports. Most of our supplies now come direct from the producing countries.

Chico Zapote, or Chicle Tree, Mexico

Balsam Tree in Salvador Cut With Trapo

The great chicle region of tropical America is that including the southermost states of Mexico and British Honduras, but the tree which furnishes it is found in other parts of central and northern South America as well. This is the *Achras sapota*, a straight tree 40 or 50 ft. high which furnishes very good cabinet wood and bears an edible fruit known as the Sapodilla pear. The chicle is obtained in the same manner as rubber latex, by tapping, but the yield per tree is often much greater than that of rubber. The yield varies with age, but on the average those trees which are regularly tapped yield 30 to 35 lb. of chicle annually. As it comes from the tree the latex has a milky appearance, but it rapidly darkens and hardens. It is boiled by primitive processes until it coagulates into a thick mass, which is pressed into uneven loaves or chunks, often of a light gray color, and exported in jute bags.

The continued and growing popularity of chewing gum in the United States, and especially since the war in certain parts of Europe, has led to speculation as to the practicability of planting the trees and in fact some experimental planting is said to have been done. Extensive planting would probably reduce the cost, but as that is not a pressing requirement there is no particular reason why present methods should be given over.

Another resinous substance known to varnish makers and manufacturers of printers' inks is "elemi," of

which several varieties occur in Latin America. One authority distinguishes four kinds, Yucatan elemi, from *Amyris plumieri*; rio elemi, from various plants; Mexican elemi, from *Amyris elemifera*; and Brazilian elemi, from *Protium heptaphyllum*.[1]

Yucatan elemi resembles the more widely used Manila elemi in that it is sold in both a hard and a soft state, although commercially Yucatan elemi is now nearly always considered as being of the hard variety. A sample of the soft elemi showed on analysis a loss of 17.07 per cent at 100 deg. C., while the hard elemi at the same temperature lost 17.86 per cent. A sample of "Vera Cruz" elemi showed quite different characteristics, except that the solubility in these various reagents was much the same.

From the little island of Dominica in the West Indies comes the so-called "gommier resin," a substance used by the natives for making torches and as incense. It also is sold in hard and soft forms. Analysis showed that samples of the hard had a melting point of 158 deg. to 164 deg. and of the soft, below 100 deg. The hard variety is completely soluble in alcohol and partly soluble in oil of turpentine, while the soft is completely soluble in oil of turpentine and partly soluble in alcohol.

A South American resin well known in medicine but not used elsewhere is "guaiacum resin," obtained from the wood of species of trees of that name. A very pure variety is sometimes called "amber guaiacum" but it is

Loading Crude Asphalt in Trinidad

not related to actual amber. Guaiacum comes in masses of a dark green or brownish black color, and also in small lumps or tears. Pure guaiacum is 87 to 96 per cent soluble in alcohol and 55 to 75 per cent soluble in ether.

A number of resinous substances are obtained from trees in Latin America to be used as medicines. The most important are a number of balsams, including balsam of copaiba, balsam of peru, and balsam of tolu. The copaiba balsams are found in a number of countries and are sold as Angostura copaiba, Bahia copaiba, Cartagene copaiba, Maracaibo copaiba, Para copaiba, etc. There are two principal classes, the thick and the thin, the Maracaibo copaiba being representative of the former and the Para variety of the latter. They are all alike in having a bitter taste and a strong odor. Peruvian balsam, so-called, is not a product of Peru, but is exported only from San Salvador, in Central America. The neighboring country of Honduras has a white Peru balsam as yet unexploited. From the northern part of South America comes the balsam of tolu, used in perfumery and medicines.

Another resinous plant the product of which is used in medicine is the Mexican scammony. It is similar in every respect to the true scammony of the East.

[1]Dieterich, Karl, as quoted in "Gums and Resins" by E. J. Parry.

Asphalt and Related Products

Asphalt is used as a base or the chief constituent of the base for paints, cements, varnishes, enamels and japans, in all cases being mixed with a volatile solvent and sometimes with pigments and filler. For varnish

Pitch Lake at Guanoco, Venezuela
This lake is 1,000 acres in area, greater than the lake in Trinidad, but shallower

making only the hard asphalts or asphaltites are used. Asphalt deposits are of widespread occurrence throughout the world, but in only a few places are they sufficiently pure to be of commercial value. The great sources of asphalt so widely used for paving and roofing are the two natural lakes in Trinidad and Venezuela. But it is known to occur also in western Venezuela, in Mexico, Cuba and Argentina, and it has been reported from other places. The most nearly pure asphalt occurs chiefly in Venezuela and eastern Mexico.

For the manufacture of protective varnishes and paints one of the most valuable of bitumens is glance pitch, or manjak, an asphaltite intermediate between the native asphalts and grahamite, and very similar to gilsonite or uintaite, the well-known substance found in Utah and Colorado. Manjak resembles gilsonite in appearance but has a higher specific gravity and a greater percentage of fixed carbon. It is black in mass, has a conchoidal fracture, a bright luster, and a specific gravity at 77 deg. F. of about 1.10. Its chief commercial source has been the island of Barbados, but it is also found in connection with the asphalt deposits near Chapapote, Mexico; in the island of Trinidad; near Chaparral, Colombia, about 100 miles southwest of Bogota; and in Santo Domingo (reported). The supplies appear to be plentiful and easily enough to satisfy any probable future demand.

A somewhat detailed account of the uses to which manjak might be put as a paint or varnish has been given by American Consul Henry T. Baker, stationed in Trinidad, who says that it is probably more abundant there than anywhere else in the world.[2] That

[2]According to the U. S. Tariff Commission Trinidad manjak is really a soft variety of grahamite (Report No. FL 7). An exhaustive review of manjak, asphalt and other bituminous substances is contained in a volume "Asphalts and Allied Substances," by Herbert Abraham, published by D. Van Nostrand Co., New York.

Making Peruvian Balsam in Salvador

island has furnished little manjak to the outside world, but its use has been of much value in domestic industries. It is described as looking like coal, odorless, hard but brittle, with a pencillated structure easy to separate into long grains. It is found in long seams between layers of clay, and one shaft from which it is mined goes down 400 ft. Its most important use in Trinidad, for which it has won a reputation for a great saving of money, is in connection with rotary drilling for oil. Soft compound is used on joints of pipes between casing threads and drill stem threads, and this prevents water, sand or grit from getting between and wearing the threads. It is much superior to white lead or other substances used for this purpose. Quoting Mr. Baker's report:

"It is boiled locally with oils at high temperatures, and made into compounds and paints for use in the oil fields for practically every purpose where a preservative is required for pipe lines, boilers, chimneys, sprocket wheels, pinions and other iron-ware, machinery, etc. Entire pipe lines are painted with it and apparently wherever it is used the metal which would otherwise deteriorate in this hot and damp climate has its life almost indefinitely prolonged. When applied in a liquid state the manjak quickly and readily hardens and gives a tough unbreakable and rubber-like coating to the parts applied. It has a low viscosity and is not affected by ordinary heat, is a most excellent insulating material, and is impervious to both water and air.

"The government of Trinidad is now making important use of manjak in the painting of underneath parts of bridges and in other cases where protection is required from water, and the Trinidad Electric Co. has met with excellent results from using manjak for the following purposes: On steel smokestacks, car trucks, fenders, buffers, car roof covered with canvas, galvanized-iron cans which are submerged in brine, iron and steel work in connection with power house and car building, insulating varnish on armatures and electrical connections, the compound in gear cases of all street cars. It has proved especially valuable in connection with car roofs, protecting the same from the hot tropical sun, rain, etc.

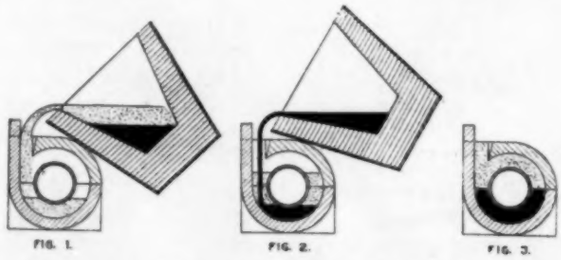
"Another important use of manjak here is in connection with ice plants, and wherever a good insulating material is required against heat and electricity. The value of manjak in this connection is said to be exceeded only by rubber and glass."

Butt Welding Pipe by the Thermit Process

There is a method of pipe welding making use of the thermit reaction which is not as widely known in the chemical engineering industries as it deserves to be. It was developed by the Metal & Thermit Corporation and it is called "thermit pipe welding," a designation that is confusing, for it is likely to be assumed from its name that it is similar in principle to the better known type of thermit welding—that is, fusion welding in which the molten metallic product of the thermit reaction flows into a gap between the pieces to be joined. This is an erroneous assumption. A thermit pipe weld is not a fusion weld; it is a butt weld in which the pieces are faced, clamped tightly together and heated by the molten products of a thermit reaction.

It would be futile to try to settle the general question as to whether the butt welding method is better than fusion (gas or arc) welding for pipe lines. Fusion welding is cheaper, especially when the pipe diameter is great and the pipe wall thin, but the metal at a fusion weld has been heated above its melting point and has all the shortcomings of cast metal. Add to this the fact that local conditions may favor the operation of either process and it became apparent that the choice of method to be used depends on the job at hand. Where great resistance to shock is necessary, a thermit pipe weld properly made is without doubt as safe a joint as it is possible to make.

The ends of the pieces of pipe to be joined are machined smooth, usually in a portable facing machine



Thermit Pipe Welding Operation

Fig. 1—Slag flowing into mold and coating outside of pipe and inside of mold

Fig. 2—Slag in mold and iron following, displacing slag in bottom part

Fig. 3—Both slag and iron in mold but iron separated from pipe and mold by film of slag

designed for the purpose, and clamped tightly together. An iron mold box is then placed around the pipe ends to receive the hot products of a thermit reaction. The thermit mixture, aluminum powder and mill scale (iron oxide), is ignited in a small crucible and when the reaction has taken place the contents of the crucible are decanted into the mold.

The products of the reaction are two non-miscible liquids, metallic iron and aluminum oxide, or slag. The latter, being the lighter, rises to the top and flows first into the mold. That part coming in contact with the cold pipe is chilled and the pipe acquires a thin solid coating of slag. This coating prevents the pipe from welding to the molten iron, which follows the slag and displaces it in the bottom of the mold.

If the correct quantity of thermit mixture has been used, the iron will not more than half surround the pipe, and when the joint has cooled the slag and iron can easily be broken away from the pipe.

The Oil Absorption of Pigments

A Study Based Upon Recent Investigations of the Wetting Properties of Paint and Varnish Vehicles and Upon the Volume Relationship Between Vehicle and Pigment

By J. H. Calbeck
Director of Research, Eagle-Picher Lead Co., Joplin, Mo.

NO DOUBT every engineer familiar with the grinding of pigments with paint vehicles has felt at times that the current theories failed to explain or clarify the property of oil absorption. This property manifests itself in two ways—so-called primary and secondary oil absorption.

1. *Primary Oil Absorption.* When a pigment is ground with an oil, there is a certain definite proportion of oil that is necessary to make a stiff paste. Additional oil simply renders the paste more mobile, while less oil leaves the mixture of a doughy consistency entirely unlike a paste paint and unfit for use as such.

2. *Secondary Oil Absorption.* This property is not usually considered an oil absorption property. It manifests itself when the paste paint is reduced to painting consistency. Its measurement is obtained by the usual methods of determining consistency or by the use of the plastometer, since both the mobility and yield value of the reduced paint are necessary to define the consistency of a paint and to determine the secondary oil absorption of a pigment. Many pigments that show high primary oil absorption show a low secondary oil absorption upon reduction, and vice versa.

It is extremely important that manufacturers of pigments be able to control both the primary and secondary oil absorption of their products. It is the current opinion that oil absorption is directly proportional to the specific surface—that is, to the particle size or fineness of the pigment. It is the purpose of this paper to show that the specific surface or fineness of the pigment has a surprisingly small influence upon the amount of oil required to make a paste or liquid paint out of a pigment and the ordinary paint vehicles, and to outline a hypothesis that more completely explains the oil absorption of pigments.

Depends Upon a Number of Variables

The oil absorption of a pigment depends upon a number of properties of both the oil and the pigment. The most important factors are: (1) Voids to be filled; (2) wetting properties of the oil; (3) nature of the surface of the solid particles; (4) specific surface or fineness of the pigment; (5) geometrical arrangement of solid particles in the paste or paint; (6) time, temperature, etc.

Voids to Be Filled[1]—If all the particles of a pigment were spheres of the same size, then the minimum volume of voids, regardless of the size of the particles, can be shown to be 32.51 per cent of the volume of the pigment when the pigment arranges itself in close or hexagonal piling and 91 per cent of the volume of the pigment when it goes into cubical piling. Figs. 1 and 2 illustrate the two types of piling. Obviously the minimum volume of voids to be filled in a dry pigment when ground in oil may vary theoretically from 91 per cent to 0 per cent depending upon the shape and uniformity of the particle, and since the distance between the particles cannot be less than the diameter of two molecules of oil and actually is many times as great, it is apparent that this volume ratio may vary between wide limits.

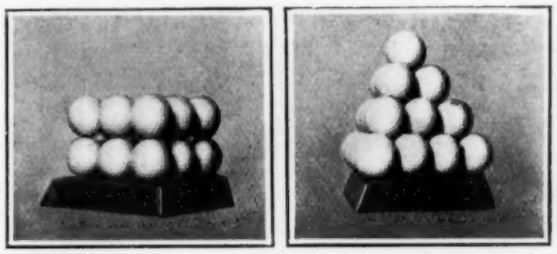


Fig. 1 and 2—Models Illustrating Cubical and Hexagonal Piling of Pigment Particles

In the following discussion it will be assumed that pigments made up of spheres all the same size are available and it will be interesting to note to what extent such a condition, although theoretically impossible, is approached by some commercial pigments. Tables I, II and III illustrate the uniformity of a zinc oxide, a basic carbonate white lead and sublimed white lead. These counts are made microscopically by a modification of the method of Green.[2] The column per cent R^3f shows the extent to which each dimension affects the total surface and per cent R^3f represents the extent to which each dimension is present by weight. The carbonate, which is typical, shows how the large and small particles share in the total weight of the pigment. This non-uniformity, together with the non-uniformity of shape, so characteristic of basic carbonate white lead, makes it impossible to estimate the voids to be filled when such a pigment is ground in oil. The sublimed white lead and the zinc oxide are extremely uniform. More than 65 per cent of the weight of either is made up of particles between 0.4 μ and 0.6 μ. The voids to be filled in such a pigment will not vary greatly from the theoretical. In fact only the finest (particles below the average) will have a tendency to decrease the voids by filling up those between average particles. Therefore, the figures and tables in this paper are based on the particle size of a uniform pigment all particles of which are spheres.

Wetting Properties of Oils—The extensive work of Harkins, Langmuir[3] and others gives us a very simple

A paper presented before the Paint and Varnish Section of the American Chemical Society at Washington, D. C., April, 1924.

[1]Not to be confused with the voids in the dry powder.

[2]See bibliography at end of paper.

[3]See bibliography at end of paper.

Table I—Particle Measurement of Sublimed White Lead

*2R Diameter In Microns	f Frequency	%f	2Rf	R²f	%R²f	R³f	%R³f	
0.2	125	22.5	25	1.25	4.5	0.125	1.6	
.4	300	34.0	120	12.0	43.0	2.4	29.6	66.2%
.6	110	19.8	66	9.9	35.4	2.97	36.6	
.8	11	2.	8.8	1.75	6.3	.70	8.6	
1.0	5	.9	5.0	1.25	4.5	.63	7.8	
1.2	2	.4	2.4	.72	2.5	.43	5.3	
1.4	1	.2	1.4	.49	1.5	.34	4.2	
1.6	1	.2	1.6	.64	2.0	.51	6.3	
	555	100.0	230.2	28.00	99.7	8.11	100.0	

Average particle size, 0.415 micron. Specific surface (Green), 2.25 $\frac{m.^2}{gram}$

Specific particle size, 0.58 micron. Specific surface (Calbeck), 1.57 $\frac{m.^2}{gram}$

Table II—Particle Measurement of Basic Carbonate White Lead

2R Diameter In Microns	f Frequency	%f	2Rf	R²	%R²f
0.2	58	16.6	11.6	0.06	0.1
.4	149	42.8	59.6	1.19	11.4
.6	99	28.4	59.4	2.67	25.6
.8	19	5.5	15.2	1.22	11.7
1.0	15	4.3	15.0	1.88	18.0
1.2	3	.9	3.6	.65	6.2
1.4	3	.9	4.2	1.03	9.9
1.6	2	.6	3.2	1.02	9.8
1.8	1	.3	1.8	.73	7.0
	349	100.3	173.6	10.45	99.7

Average particle size, 0.498 micron. Specific surface (Green), 1.77 $\frac{m.^2}{gram}$

Table III—Particle Measurement of Zinc Oxide

2R Diameter In Microns	f Frequency	%f	2Rf	R²f	%R²f	R³f	%R³f	
0.3	8	2.9	2.4	0.18	8	0.026	0.4	
.4	25	9.1	10.0	1.00	4.7	.20	3.3	
.5	135	49.3	67.5	8.44	40.0	2.16	35.2	70.4%
.6	80	29.2	48.0	7.20	34.2	2.16	35.2	
.7	17	6.2	11.9	2.40	11.4	.73	11.9	
.8	4	1.5	3.2	.64	3.0	.26	4.2	
.9	2	.7	1.8	.40	2.0	.18	2.9	
1.0	2	.7	2.0	.50	2.4	.20	3.3	
1.2	1	.4	1.2	.36	1.7	.216	3.5	
	274	100.0	148.0	21.12	100.2	6.132	99.9	

Average particle size, 0.54 micron. Specific surface (Green), 1.96 $\frac{m.^2}{gram}$

Specific particle size, 0.57 micron. Specific surface (Calbeck), 1.86 $\frac{m.^2}{gram}$

Table IV—Specific Wetting Power of Various Oils

Description of oil	cm²/m	Area Cross-Section cm²/10⁻¹⁶	Width* of Molecules cm × 10⁸	Depth† of Molecules × 10⁸
Raw linseed oil	7,480	109	10.45	14.4
Boiled linseed oil	9,470	123	11.10	11.1
Oxidised linseed oil	12,500	165	12.85	8.0
Oleic acid com	7,860	36.8	6.0	14.0

* The width of the molecule may be estimated by taking the square root of the area of cross-section. To determine the area cross-section of the molecule apply formula

$$\frac{\text{Molar weight} \times \frac{\text{cm.}^2}{\text{mg.}} \times 10^8}{6.06 \times 10^{23}} = \text{Area of molecule}$$

† The depth of the molecular film

$$\text{Depth} = \frac{10^3}{\text{Sp. Gr. of oil} \times \frac{\text{cm.}^2}{\text{mg.}}}$$

and understandable theory of the wetting and spreading of oils. This work, based on observations made on the spreading of oils on water, established as a fact that wetting is a chemical phenomenon and depends upon a chemical union between an active group in the oil, and the water or the solid. Langmuir says, "The forces involved in absorption, surface tension, etc., are strictly chemical in nature—that is, do not differ in any essential respect from the forces causing the formation of typical chemical compounds." Furthermore, when true wetting occurs, the molecules of the wetting are oriented along the interface and this layer of oriented molecules is one molecule thick. Following the procedure as outlined by Langmuir (*Jour. Am. Chem. Soc.*, vol. 39, p. 1848) the writer has examined a number of typical oils and has determined what may be called their "specific wetting power."

The specific wetting power of an oil may be defined as the number of square centimeters of a clean water surface that one milligram of the oil will cover in a layer one molecule thick, or cm.² ÷ mg. = specific wetting power.

The specific wetting power of the oils in the table is in direct proportion to their ability to wet pigments as determined by practical experience and it has the advantage of assigning numerical value to this property.

There is no direct experimental evidence that the wetting properties of these oils will be the same on solids as on water, but their relative values should remain the same.

It seems, therefore, that in a paint consisting of linseed oil and zinc oxide, lead carbonate or sublimed white lead the union between the pigment and oil is a chemical one, that the interface between the solid and

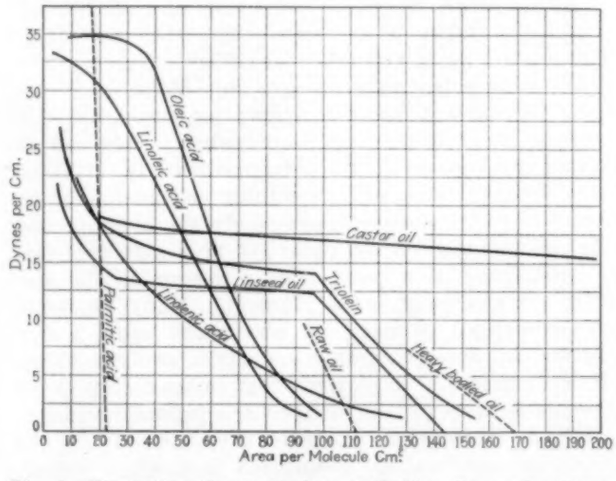


Fig. 3—Illustrating the Reduction of Wetting Power by Force (Based on data from Langmuir, *J.A.C.S.*, vol. 39, p. 1880)

liquid phases instead of being one of mysterious physical properties consists of a single layer of linseed oil molecules with the active group held by secondary valence to the solid pigment and the hydrocarbon chains binding the film to the oil. The free fatty acids present combine with the lead to form soaps, and these soaps, being soluble in the oil phase, gradually break loose from their position in the interface and dissolve in the oil, while other molecules properly oriented take their place in the interface. The theory emphasizes the importance of chemically active pigments and explains to a certain extent why the inerts do not make durable paints when used without a small percentage of zinc or lead pigment.

The specific wetting power represents the maximum wetting power and it must be emphasized that the capacity of any oil to cover a given surface is restricted when force is applied. Fig. 3 shows the reduction in the area per molecule by force. Note that the heavy bodied linseed oil, although having an initial wetting power almost twice that of raw linseed oil, has about the same wetting power under a force of 15 dynes per centimeter and that the heavy bodied oil contracts more easily under force than raw oil. This is in accord

with paint experience. The raw oil gives a paint of the greater yield value, whereas a paint made with nothing but heavy bodied oils would run and sag regardless of how little oil was used. The oxidation of the linseed oil increases the number of active groups (OH groups located in the center of the hydrocarbon chain) in the molecule, and these additional groups have a tendency to pull the molecule over on its side and to increase the area wet by the molecule. However, the secondary valence of the OH groups is so much less than the alkyl group that little force is necessary to dislodge them from the interface and thereby reduce the area covered.

Nature of the Surface of a Solid Particle—The nature of the surface of the solid particle probably has as much to do with the oil absorption of pigments as the specific wetting power of the oil. The orientation of the atoms of the solid surface affects the wetting. Such surfaces may have regular crystal faces like carbonate white lead, whereas the fumed pigments probably have an amorphous or glass-like surface. The presence of adsorbed gases, moisture and impurities may make

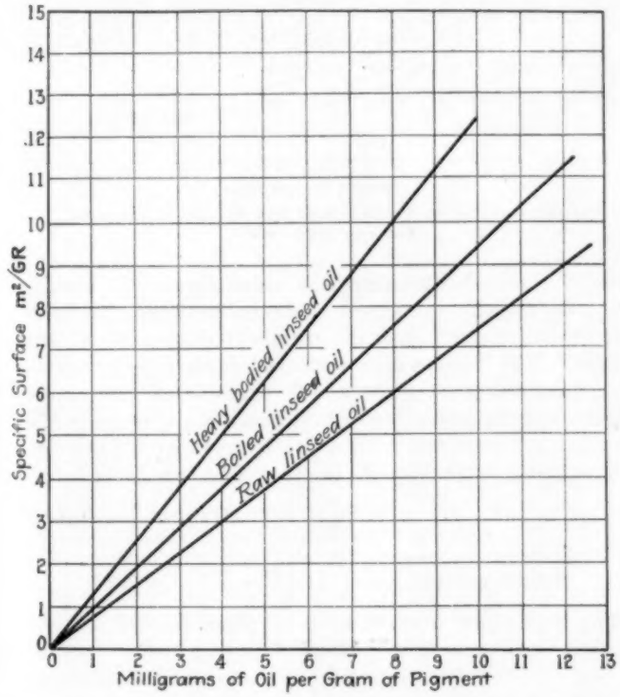

Specific Surface m²/GR
Heavy bodied linseed oil
Boiled linseed oil
Raw linseed oil
Milligrams of Oil per Gram of Pigment

Fig. 4—Graph for Determining the Weight of Oil Actually Used in Wetting the Pigment Surface

great differences in the behavior of a pigment in oil. Moisture as a rule increases both the primary and secondary oil absorption. Absorbed gases affect only the primary oil absorption, because the vehicle is usually able to displace the gas (in a monomolecular film too) at the interface. The condition at the interface may be completely reversed when the oil instead of wetting the surface is separated from it by a monomolecular film of adsorbed gas. When the oil is separated from the pigment by the gas its surface has the same properties as the ordinary oil-air interface with the chain ends of the molecules closely packed together at the surface and the active groups in the interior of the oil. But when the gas molecules are removed by dissolving in the oil or by collecting in bubbles and finally passing out, the active group is turned toward the pigment. This

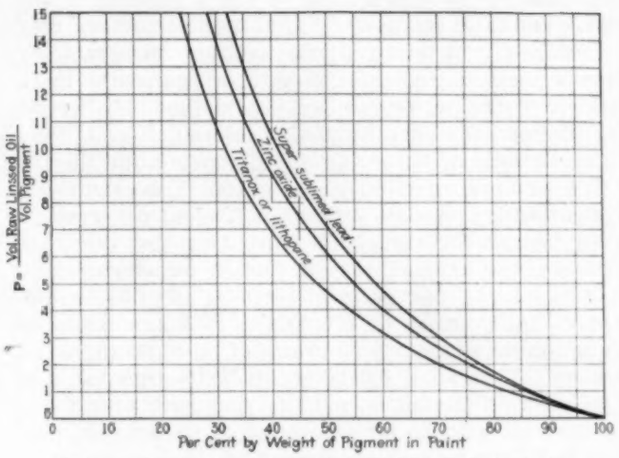

P = Vol. Raw Linseed Oil / Vol. Pigment
Super sublimed lead
Zinc oxide
Titanox or lithopone
Per Cent by Weight of Pigment in Paint

Fig. 5—Graph for Converting Weight Relations to a Volume Basis

should explain the high primary oil absorption of some zinc oxides.

The effect of moisture and other impurities is not so easily illustrated and no doubt depends more upon the chemical properties of the pigment and oil; for example, we should expect moisture to decrease the oil absorption of lead and zinc pigments and act the same as an absorbed gas upon the more inert pigments. If the adsorbed moisture is present in a monomolecular film, the contact cannot be considered a liquid-liquid interface. When more moisture is present than the monomolecular film, then the liquid-liquid interface is present and the effect of the moisture is to increase the oil absorption and make the grinding more difficult. Moisture, moreover, may become emulsified in the oil and further complicate the situation.

The use of wetting oils in conjunction with non-wetting mineral oils may be mentioned. The mineral oils form film many molecules thick and lack the orientation characteristic of the linseed oil interface. It may be that when mineral oil is used in conjunction with wetting oils the wetting oil occupies an oriented position at the interface. Only sufficient wetting oil to cover completely the surface of the pigment particles should be necessary to make a kerosene zinc oxide paste act like a linseed oil zinc oxide paste.

Effect of Specific Surface—In view of these theories on wetting it should be an easy matter to calculate the

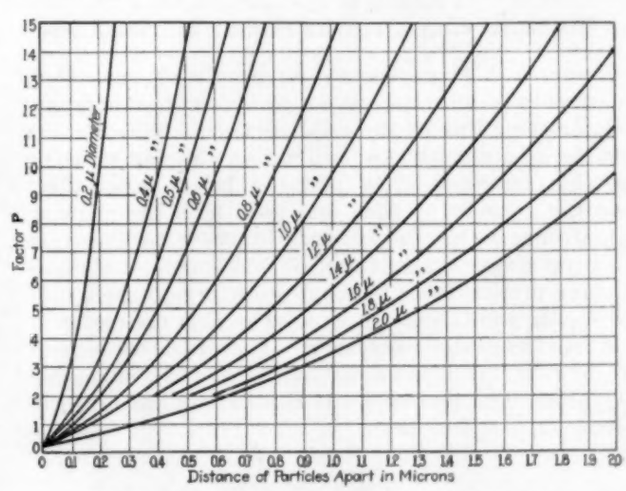


Fig. 6—Distance Between Pigment Particles for Hexagonal Piling

actual amount of oil required to wet a pigment if the specific surface is known. The specific surface may be accurately determined in uniform pigments by Green's method and in non-uniform pigments by a method of the writer or by the method of Perrott and Kinney. To simplify the calculating Fig. 4 gives the milligrams of oil per gram of pigment for specific surfaces from 0 to 15 sq.m. per gram. For example, a pigment with a specific surface of 2 sq.m. per gram, a figure typical for high-grade zinc, lead and lithopone pigments, the amount of raw linseed oil employed in actually wetting one gram of pigment is 0.0026 gram. Suppose the primary oil absorption of a zinc oxide by the minimum method[1] is 20 grams of oil to 80 grams of pigment. Then 80 × 0.0026 equals 0.208 gram, or only 1 per cent of the oil is actually employed. Similarly a white lead with an oil absorption of 92 per cent pigment and 8 per cent oil uses only 3 per cent of the oil.

It should be apparent, therefore, that specific surface or fineness is not solely responsible for variations in the oil-taking properties of pigments and that oil absorption should not be taken as a measure of fineness. That the fineness of some pigments varies directly as the oil absorption cannot be denied, but such conditions obtain only when the coefficients of uniformity of the pigments are the same, the nature of the surface remains the same, the geometrical arrangement of the solid particles and conditions of time, temperature and pressure remain the same. Obviously this is a rather long list of variables to measure or control.

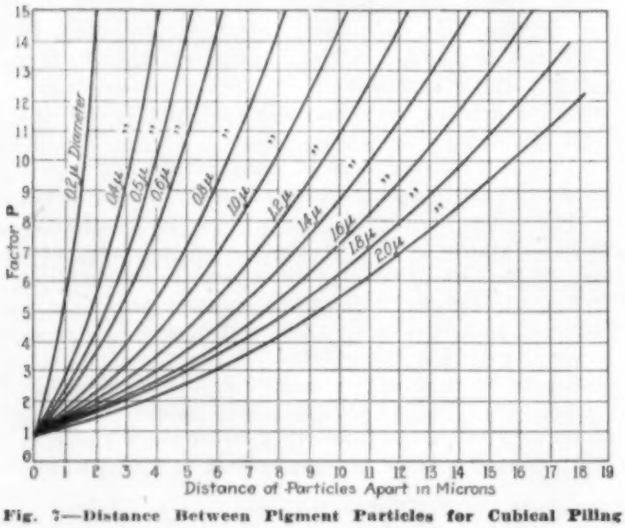


Fig. 7—Distance Between Pigment Particles for Cubical Piling

Geometrical Arrangement—As previously suggested, the voids to be filled depend on the geometrical arrangement or the piling of the solid particles. Whether the particles of a pigment are uniform in size and shape or not, this arrangement of particles has a great effect upon the voids to be filled and upon both the primary and secondary oil absorption. In order to illustrate this point a very extensive set of tables and calculations has been prepared, but to simplify the presentation only the results and tables will be used in this discussion.

It is frequently necessary, of course, to convert weight relations to the volume basis, and this suggested the factor P to represent the ratio of volume of oil to volume of pigment, or

$$P = \frac{Vol.\ of\ oil}{Vol.\ of\ pigment}$$

[1]See Circular 85, Paint Manufacturers Association.

By the use of Fig. 5 all percentages by weight for points consisting of linseed oil and lithopone, titanox, zinc oxide and white lead may be converted into factor P. The curve for white lead is for supersublimed white lead, but since its specific gravity lies half way between that of sublimed white lead and basic carbonate white lead, all values can be had without serious error.

Now, assuming all particles to be spheres of the same size, the distance between particles may be obtained by using Fig. 6 when the particles assume the hexagonal arrangement and Fig. 7 when they go into cubical

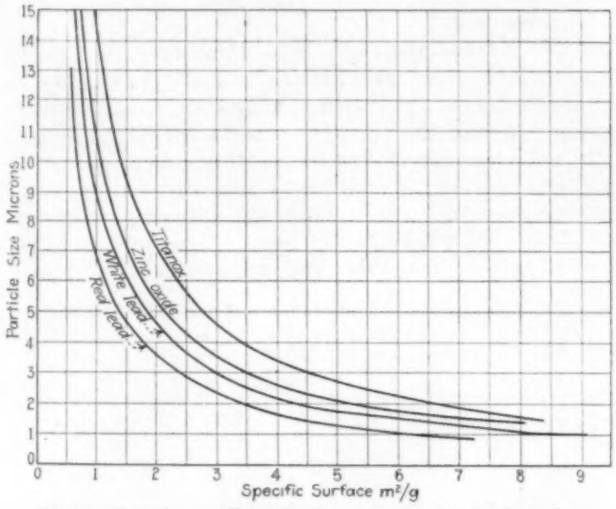


Fig. 8—Relation of Particle Size and Specific Surface for Various Pigments

piling. Ordinates measure the volume ratio P, abscissas indicate the minimum distance between particles and the lines represent the different diameters of the sphere. The figures are employed merely to simplify the calculations. Compare, for example, a zinc oxide (ZnO) and supersublimed white lead ($Pb_3S_2O_8$) each 100 per cent uniform and with a particle size of 0.5 micron. The specific surfaces will be (see Fig. 8) as follows:

	Sq.M. Per Gram	Oil Required, Grams (See Fig. 4)
ZnO	2.12	0.0028
$Pb_3S_2O_8$	1.82	0.0024

The voids per unit volume of pigment will be the same if each goes into hexagonal piling. The amount of raw oil in each case to fill the voids will be, allowing for a film of oil 7 molecules thick between the particles

$$1\ gram\ Pb_3S_2O_8 = \frac{1}{6.6} \times 0.406 \times 0.93 = 0.0573\ gram$$

$$1\ gram\ ZnO = \frac{1}{5.66} \times 0.406 \times 0.93 = 0.0666\ gram$$

To summarize:

$Pb_3S_2O_8$		ZnO	
Oil for wetting	0.0024 gram	Oil for wetting	0.0028 gram
Oil for voids	0.0573 gram	Oil for voids	0.0666 gram
Total	0.0597 gram	Total	0.0694 gram

Supersublimed white lead will grind 92 lb. of pigment to 8 lb. of oil—that is, 1 gram requires 0.087 gram of oil. Since 0.087 gram less 0.0597 gram equals 0.0273 gram, a difference of 31 per cent of the actual oil required is unaccounted for.

But zinc oxide requires 18 lb. of oil to grind 82 lb. of pigment—that is, 0.2195 gram of oil per gram of

pigment—and since 0.2195 less 0.0694 = 0.1505 gram, a difference of 68 per cent of the actual oil required is unaccounted for.

No doubt some of this discrepancy may be explained by the nature of the surfaces of the solid particles and by the extent to which these pigments fall short of 100 per cent uniformity. But the writer has examined hundreds of different zinc oxides and sublimed white leads and has never found an instance in which the lead required more oil than the zinc, and has come to the conclusion that the zinc oxide cannot by any means be forced into the close or hexagonal piling, whereas the lead pigments when ground in low percentages of oil assume that arrangement. In Fig. 7 the reader will notice that 0.9 is the lowest possible value for P, with cubical piling. Accordingly the highest percentage of lead that can exist in cubical piling is 88.7 per cent pigment and 11.3 per cent oil, whereas in hexagonal piling the highest percentage of lead is 95.5 per cent. All leads will grind between

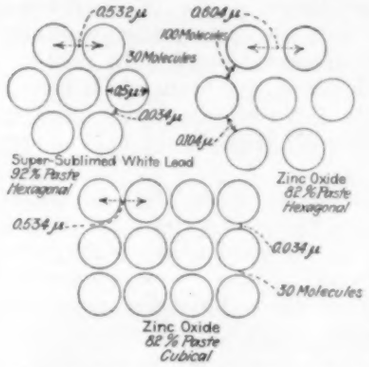


Fig. 9—Cubical and Hexagonal Packing of Supersublimed White Lead in 92 Per Cent Paste and Zinc Oxide in 82 Per Cent Pacts

90 and 93 per cent pigment, so the hexagonal arrangement must prevail.

The highest percentage of ZnO that can exist in cubical piling is 87.2 per cent. The writer has never seen a pure zinc oxide that will grind in less than 15 per cent oil, and this is in close agreement with the minimum for cubical piling considering that a slight difference must be allowed for increase in voids due to the particles being separated by a thin film of oil.

It is interesting to note the differences in the voids between pigments when made into paints of different composition. Fig. 9 illustrates the magnitude of the oil film between the particles of supersublimed white lead[5] when ground in a 92 per cent paste. The distances are easily obtained from Figs. 6 and 7. In this case a particle size of 0.5 micron is taken. Fig. 9 also shows an 82 per cent zinc oxide paste, in both the cubical and hexagonal piling. Note that the distance between particles for ZnO in the cubical is the same as for supersublimed white lead in the hexagonal—that is, 0.034 micron or 30 molecules apart. Fig. 10 is interesting inasmuch as it illustrates the volume differences between a lead paint with 70 per cent pigment and a zinc paint with 50 per cent pigment, both of painting consistency and both in the hexagonal piling. Fig. 11 illustrates sublimed blue lead, the particle size of which is less than 0.3 micron, and supersublimed white lead with a particle size of 0.5 micron. The volume relations

[5]Supersublimed white lead is suggested because it is zinc free.

in both paints are the same, the oil absorption is the same, although the particle size of one is half as large as that of the other.

The geometrical arrangement may also explain certain peculiarities in secondary oil absorption or in the consistency of the reduced paint. To illustrate, let us compare zinc oxide in linseed oil with supersublimed white lead in oil, because these two pigments invariably make paints with greatly different consistencies when

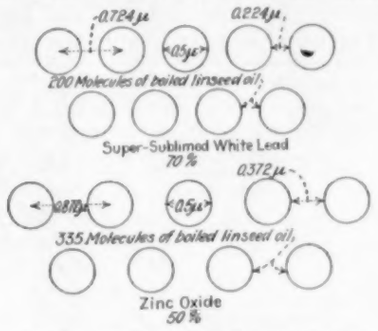


Fig. 10—Volume Differences Between 70 Per Cent White Lead and 50 Per Cent Zinc Oxide Paints, Both in Hexagonal Piling

made up in the same proportions by volume. This difference in consistency cannot be a matter of specific surface only, because the coarsest zincs make thicker paints than the finest leads. Sublimed blue lead, for example, grinds in the same proportions as sublimed white lead and the particle size of sublimed blue lead is less than one-half that of sublimed white lead and has a specific surface of more than twice as much. Yet the pastes and reduced paints of both are alike for the same proportions.

This comparison is more easily understood with the use of Fig. 12. The zinc oxide paints are listed along the ordinate and the supersublimed white lead listed along the abscissa, both in percentages by weight. Line I is the line of equal volumes. A 50 per cent zinc paint by weight has the same composition by volume as

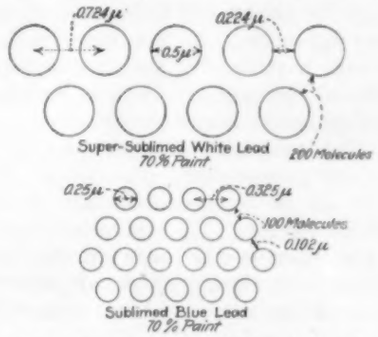


Fig. 11—Sublimed White and Blue Lead in 70 Per Cent Paints

a 54 per cent lead paint. Line II is the line of equal consistencies. It is generally accepted that a 50 per cent zinc paint has about the same consistency as a 70 per cent lead paint, and line II is based on practice. Suppose the consistency or mobility of the paint is a function of the mean distance between particles. Then if the lead and zinc paints both are piled or arranged in the same way, the only variable that can affect the mean distance between particles is particle size. Line III illustrates the line of equal consistencies if the zinc oxide has a particle size of 0.4 micron and the super-

sublimed white lead has a particle size of 0.6 micron and both are in cubical piling. Line IV shows both in the hexagonal piling. Line V illustrates the line of equal consistency when the zinc oxide with a particle size of 0.4 micron goes into cubical piling compared with supersublimed white lead with a particle size of 0.6 micron in the hexagonal piling. This is an extreme case and does not compare closely with the experimental line of equal consistencies. Line VI is based on both pigments having the same particle size but with the lead in the hexagonal and the zinc in the cubical piling.

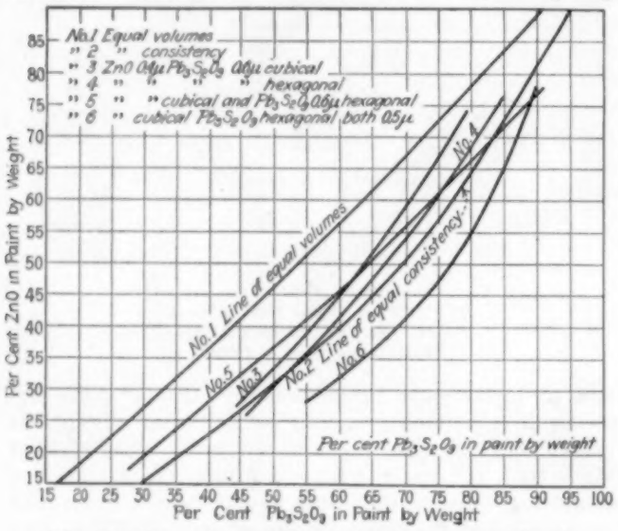

No.1 Equal volumes
" 2 " consistency
" 3 ZnO 0.6μ $Pb_3S_2O_9$ 0.6μ cubical
" 4 " " " " hexagonal
" 5 " " cubical and $Pb_3S_2O_9$ 0.6μ hexagonal
" 6 " cubical $Pb_3S_2O_9$ hexagonal both 0.5μ
No.1 Line of equal volumes
No.2 Line of equal consistency
No.3
No.4
No.5
No.6
Per cent $Pb_3S_2O_9$ in paint by weight
Per Cent ZnO in Paint by Weight
Per Cent $Pb_3S_2O_9$ in Paint by Weight

Fig. 12—Comparison of Zinc Oxide and Supersublimed White Lead Paints

The geometrical arrangement and particle size, therefore, seem to be about equally responsible for differences in secondary oil absorption if the hypothesis of the mean distance between particles may be considered as a factor in the mobility of the paint.

Conclusion

The effects of time and other minor factors in the consideration of oil absorption are easily controlled and do not account for the major differences in oil absorption of two pigments. It has been demonstrated, however, that the particle size and specific surface cannot be considered the only or even the greatest factors in the oil absorption of pigments and that voids to be filled, the wetting properties of the oil, the nature of the solid surface and geometrical arrangement of the pigment particles all go to make the oil absorption an extremely difficult property to control or predict. It is hoped that the suggestions made in this paper will stimulate interest in these phases of paint research which in the past have largely been neglected.

Bibliography

W. D. Harkins, Earl C. H. Davies and George L. Clark, "The Orientation of Molecules in the Surfaces of Liquids, Etc." *J. Am. Chem. Soc.*, vol. 39, p. 541.

W. D. Harkins, George L. Clark and Lathrop E. Roberts, "The Orientation of Molecules, Etc." *J. Am. Chem. Soc.*, vol. 42, p. 700.

Irving Langmuir, "The Constitution and Fundamental Properties of Solids and Liquids. *J. Am. Chem. Soc.*, vol. 39, p. 1848.

Irving Langmuir, "The Constitution of Liquids, With Especial Reference to Surface Tension Phenomena." *Chem. & Met.*, vol. 15, p. 468.

E. L. Griffen, "Interfacial Films of Emulsions." *J. Am. Chem. Soc.*, vol. 44, p. 1648.

W. C. McC. Lewis, "A System of Physical Chemistry." Part I, p. 476.

Wilder D. Bancroft, "Applied Colloidal Chemistry," p. 157.

Henry Green, "A Photomicrographic Method for the Determination of Particle Size." *J. Frank. Inst.*, vol. 192, p. 637.

G. St. J. Perrott and S. P. Kinney, "The Meaning and Microscopic Measurement of Average Particle Size." *J. Am. Ceramic Soc.*, vol. 6, p. 417.

J. H. Calbeck and H. B. Hart, "The Particle Size of Litharge." Unpublished (1922).

J. R. Macgregor, "A New Paint Theory." *Paint, Oil & Drug Review*, March 28, 1917.

Iodine From Artesian Wells

Iodine is produced in Netherlands India by the Vereenigde Javasche Iodiumfabrieken and the Naamlooze Vennootschap Exploitatie Maatschappij Goenoekwatoe, both with headquarters at Soerabaya, Java. It is not recovered from seaweed, as published statements indicate, but comes from artesian-well water in the residencies of Soerabaya and Cherbion. The product is marketed and exported in the form of copper iodide, iodine and potassium iodide. Most of the output goes to Great Britain, the importations declining, however, in ratio with decreased supply. In 1922 the exports of copper iodide from Netherlands India amounted to 46,286 kg.; in 1923, to 31,584 kg. Similarly, exports of iodine decreased from 25,431 kg., in 1922 to 19,362 kg. in 1923.

The production of considerable quantities of copper iodide from artesian-well water is considered an interesting phase of chemical work in the Dutch colonies, and it is felt that information on the precise occurrence of the iodine and the technique of manufacture of commercial products would be valuable.

Production of Clay in 1923

The output of clay mined and sold as clay in the United States in 1923 amounted to 3,434,660 short tons, valued at $11,188,913, or $3.26 per ton, according to the Department of the Interior, as determined by figures compiled by the Geological Survey in co-operation with State Geological Surveys in Alabama, Florida, Georgia, Illinois, Iowa, Maryland, Michigan, Missouri, New Jersey, New York, North Carolina, Virginia, Washington and Wisconsin. These figures show an increase of 30 per cent in quantity and 34 per cent in value as compared with those for 1922. They represent only clay sold as clay by the original producers; they do not include the much greater quantity of clay that was burned into clay products by the producers.

The output of kaolin, the clay that is used in making high-grade pottery and porcelain as well as paper and other products, amounted to 336,803 tons, valued at $2,926,255, an increase of 22 per cent and 25 per cent, respectively, as compared with 1922. The clay of largest production and value is fireclay. The sales of fireclay in 1923 amounted to 2,298,163 tons, valued at $6,565,899, an increase of 37 and 42 per cent, respectively, as compared with 1922. The output of clay of every kind increased in quantity and value in 1923 as compared with 1922, except stoneware clay, which decreased slightly in quantity but increased in value.

The imports and exports of clay also increased in 1923 as compared with 1922. The imports were 391,354 tons, valued at $3,670,369, an increase of 9 per cent in quantity and 8 per cent in value. The imports of kaolin, the chief clay imported, amounted to 311,298 tons, an increase of less than 1 per cent.

Magnesium

New Methods of Producing This Metal Are Rapidly Changing Its Industrial Status, Especially as a Material of Construction

THE production of magnesium is now approaching the point where large quantities can be obtained at a reasonable price. New metallurgical developments have made possible the manufacture on a large scale of a metal of high purity, so that in its present status magnesium occupies a position similar to that once held by aluminum, and it has to a considerable degree the same potentialities.

Some years ago aluminum "arrived." We had known something about it and we had made use of it industrially to a slight extent for many years, when it suddenly began to develop rapidly into a commercially available material of construction. New methods of reducing it from its ore made possible large-scale production of a more dependable metal at a much lower price than had been possible before. Magnesium, in a similar way, is developing rapidly now. Production methods have been evolved that are making possible a lower price and the avoidance of injurious impurities that for years have given this metal a bad name as a material of construction. Its uses are developing rapidly. Industries are testing it for various purposes and it is being studied as never before, for research with a possibility of immediate return is easier to finance than research for which the returns seem distant. Consequently our knowledge of the metal increases by leaps and bounds. Magnesium is worthy of attention at the present time, because it is "moving." It is a new arrival among the commercial metals.

Magnesium has not yet reached the point where its applications, especially as a material of construction, in the chemical engineering industries can be cataloged, but its properties and those of its alloys are becoming accurately known. It is possible to describe them and the uses that these metals are finding in other fields. Its application to the chemical engineer's field is left for him to discover. There is no telling where it may find applications of importance that would not be apparent to any but the man who needs a metal with a certain combination of properties not found elsewhere. It is a well-known fact that uses of "new" metals are found more often by the future user than by the producer.

The most important mechanical properties are given in Table I. As in the case of most pure metals, the proportional limit is low. The stress-strain diagram departs very gradually from a straight line and it is difficult to determine acurately the beginning of curvature. Since the slight deformation caused by a load increases the proportional limit, higher unit stresses may be applied than would be indicated by the proportional limits given in the table. The specific heat, thermal coefficient of expansion, melting point and several other physical properties of magnesium are of the order of magnitude of those of aluminum.

The chemical properties of magnesium are more widely known than the physical properties of the metal and they have been used to a greater extent. Probably the one best-known fact regarding magnesium is that it will burn in air. We should expect from this that the metal would corrode readily and be subject to the disadvantages inherent in a flammable material. It has been found that if the troublesome impurities, principally sodium and chlorides, are avoided, the tendency toward corrosion is greatly reduced; and it is now known that in order to ignite magnesium practically the whole piece of metal must be raised well above the melting point (which is 1,200 deg. F.); hence it is evident that the metal is in much less danger from fire than many materials of construction that we do not hesitate to use where it is to our advantage to do so. In a finely divided condition it has found a place of some importance as a dehydrating agent. The powder is added to a liquid to be dehydrated—for instance, transformer oil or aniline—and it reacts with the least trace of moisture to produce hydrogen and magnesium hydroxide. The hydrogen bubbles off and the precipitate is easily removed.

As a deoxidizer in the manufacture of many metals and alloys magnesium has found a valuable application. A metal to be strong and reliable must be clean—that is, it must contain as few non-metallic inclusions as possible. The most prevalent harmful inclusions in metals are oxides, and these can be eliminated largely by reducing them to metal by adding small quantities of metallic magnesium or another deoxidizer to the molten metal. Magnesium has a greater affinity for oxygen than the metal being treated and the violence of its re-

Table I—Mechanical Properties of Pure Magnesium

Density Grams Per c.c.	Lb. Per Cu.In.	Process of Manufacture	Condition or Heat-Treatment	Tensile Strength, Lb. Per Sq.In.	Per Cent Elongation in 2 In.	Per Cent Reduction Area	Proportional Limit, Lb. Per Sq.In.	Lb. Per Sq.In. for ¼ Per Cent Extension Under Load	Compressive Strength Lb. Per Sq.In.	Shear Strength, Lb Per Sq.In.	Hardness	
											Brinell 500 Kg. Load 10 mm. Ball	Shore Scleroscope
1.739	0.0629	Casting (sand).....	As cast.....	13,000	6	6	500	3,000	32,000	14,000	30	20
1.739	.0629	Extrusion.....	As extruded.....	28,000	8	8	1,000	6,500	45,000	16,000	35	23
1.739	.0629	Rolling (sheet).....	As rolled.....	25,000	4	5	2,500	9,500	.....	14,000	40	31
1.739	.0629	Rolling (sheet).....	Annealed.....	25,000	5	6	2,000	9,000	.....	14,000	33	27

action with oxygen is in many cases advantageous, for the stirring effect is sometimes very important. The magnesium oxide formed in the deoxidizing reaction is very light and it rapidly rises to the surface of the molten metal, where is can easily be removed. Since any excess of deoxidizing material will remain in the metal, the fact that many metals are unharmed by the addition of magnesium makes it a convenient deoxidizer as well as an efficacious one. At present its cost (about $1 per lb.) is high for this purpose, and wide application cannot be expected until the price is lower.

First Produced in Germany

Until recently magnesium was for the most part produced by the electrolysis of fused magnesium chloride, to which was added fused sodium chloride and potassium chloride to maintain a low melting point of the bath. Production on a large scale was first accomplished in Germany, the raw material being obtained from the Stassfurt salt deposits. The method was not only conducive to the production of a metal containing harmful impurities but it was also fraught with serious difficulties. If the molten magnesium came in contact with the evolved chlorine, recombination took place and the accidental presence of magnesium oxide in the bath

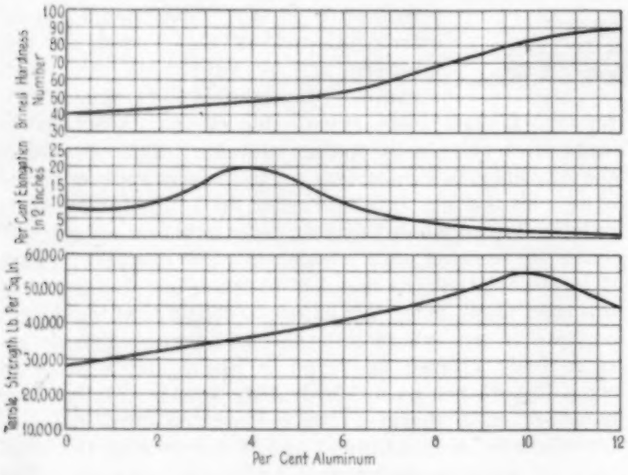


Fig. 1—Mechanical Properties of Magnesium-Aluminum Alloys That Have Been Extruded, Quenched and Aged

seriously interfered with the electrolysis. These and other difficulties were largely overcome by greatly complicating the process, but two great disadvantages remain: The process is discontinuous and expensive.

Many reasons have been advanced for the corrodibility of magnesium containing sodium and chloride, but the most adequate is that of Ulick R. Evans, a famous British authority on corrosion. It is enlightening to consider his explanation, keeping in mind the fact that the resistance to corrosion in the presence of moisture is due to a protective film of magnesium hydroxide. He says:

> Ammonium chloride has, as is well known, a considerable solvent power for magnesium hydroxide, and thus its presence will prevent the formation of a protective film. It is often stated that the same explanation cannot be extended to the case of the other chlorides (for example, potassium chloride), because when magnesium is attacked by potassium chloride a copious precipitate of magnesium hydroxide appears. But although the solvent power of potassium chloride may not be sufficient to prevent the formation of solid magnesium hydroxide entirely, it may be sufficient to modify the character of the hydroxide precipitated; a substance precipitated from a solution in which it is partly soluble usually differs considerably in physical condition from the same substance precipitated from a solution in which the solubility is very low. Futhermore, it is rather to be expected that the presence of chlorides in the solution will tend to "loosen" the hydroxide, causing the compound to enter the body as a diffuse precipitate, instead of adhering to the surface of the metal as a tight protective film. Any dissolved substance which lowers the interfacial tension between the water and the hydroxide is likely to have this

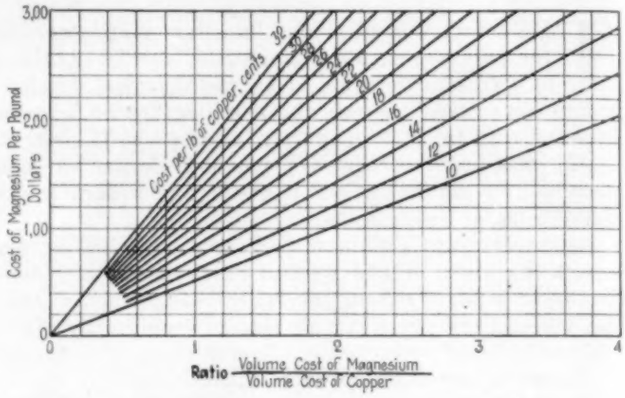


Fig. 2—Comparative Cost of Magnesium and Copper Per Unit of Volume

loosening action, and the fact that chlorides are known in many cases to have a peptizing action upon precipitated hydroxides would seem to indicate that chlorides do reduce the interfacial tension between the hydroxides and the water.

New American Process

The new process that has so greatly changed the possibilities of magnesium as a metal is a method developed by the American Magnesium Corporation for electrolyzing magnesium oxide. In this process the oxide is added to a bath of fused fluorides, principally magnesium fluoride, in a specially developed electric furnace. The lining of the furnace is composed of unfused electrolyte, which, being next to the cool walls, remains in the solid state. Magnesium oxide is continuously added to the bath, while magnesium metal is removed at one electrode and carbon monoxide (the carbon coming from the electrode) is evolved at the other.

Magnesium oxide is only slightly soluble in the fluoride bath—in which respect it differs considerably from aluminum oxide—the solubility being only about 0.1 per cent. Strictly speaking, therefore, the process is probably not a direct electrolysis of the oxide. It has been suggested that the mechanism is as follows:

$$MgF_2 = Mg + F_2$$
$$MgO + F_2 = MgF_2 + O$$
$$C + O = CO$$

Magnesium fluoride is electrolyzed, producing magnesium and fluorine. The latter immediately combines with the magnesium in solution to produce more magnesium fluoride. As this dissolved oxide is broken up, more dissolves, keeping the solution saturated. The oxygen of the oxide, which is replaced by fluorine, combines with the carbon of the electrode to produce carbon monoxide. It is evident that in metal produced by this process the presence of sodium or chlorides is practically impossible and that the detrimental effects of these impurities are avoided.

Magnesium even when produced by the new method cannot be set down as "a corrosion-resisting metal," since that phrase has come to imply a rather general

Table II—Mechanical Properties of Magnesium-Aluminum Alloys

Composition	Density Grams Per c.c.	Lb. Per Cu. in.	Process of Manufacture	Condition or Heat-Treatment	Tensile Strength, Lb. Per Sq.In.	Per Cent Elongation in 2 In.	Per Cent Reduction Area	Proportional Limit, Lb., Per Sq.In.	Lb. Per Sq.In. for 1 Per Cent Extension Under Load	Compressive Strength Lb. Per Sq.In.	Shear Strength, Lb. Per Sq.In.	Hardness	
												Brinell 500 Kg. Load 10 mm. Ball	Shore Scleroscope
96% Mg 4% Al	1.767	0.0638	Casting (sand).	As cast.....	25,000	9	8	2,500	7,000	45,000	17,000	42	25
			Extrusion.....	As extruded..	36,000	20	33	3,000	11,000	52,000	19,000	48	28
			Rolling (sheet).	As rolled.....	41,000	8.5	10	7,500	10,500	.....	19,000	61	38
			Rolling (sheet).	Annealed....	34,000	16	15	3,000	8,500		19,000	46	32
94% Mg 6% Al	1.780	.0643	Casting (sand)..	As cast.....	24,000	7	7	2,000	8,500	46,000	18,000	46	28
			Casting (sand)..	Heat treat...	25,000	5	5	2,500	9,000	46,000	20,000	50	31
			Extrusion.....	As extruded..	41,000	16	21	5,500	15,000	58,000	22,000	54	32
			Extrusion.....	Heat treat...	41,000	10	10	8,000	14,500	58,000	22,000	53	31
			Rolling (sheet).	As rolled.....	46,000	3	5	5,000	14,500	.....	22,000	75	43
			Rolling (sheet).	Annealed....	38,000	9.5	9	4,000	11,500		19,000	52	30
92% Mg. 8% Al	1.790	.0647	Casting (sand)..	As cast.....	20,000	2	2	2,000	9,000	45,000	18,000	53	31
			Casting (sand)..	Heat treat...	27,000	5	5	3,000	8,500	47,000	20,000	52	31
			Casting (sand)..	Heat treat...	30,000	1	1	5,000	12,000	53,000	22,000	73	43
			Extrusion.....	As extruded..	46,000	9	12	10,500	15,500	61,000	22,000	59	37
			Extrusion.....	Heat treat...	47,000	4	4	8,000	15,000	64,000	23,000	68	38
			Rolling (sheet).	As rolled.....	46,000	7	7	11,000	15,000	.....	22,000	69	40
			Rolling (sheet).	Annealed....	41,000	8.5	8	5,000	14,000		19,000	54	31
90% Mg 10% Al	1.806	.0652	Casting (sand)..	As cast.....	19,000	1	1	2,500	10,000	49,000	19,000	57	33
			Casting (sand)..	Heat treat...	23,000	2.5	3	3,500	9,000	48,000	21,000	55	29
			Casting (sand)..	Heat treat...	27,000	1	1	10,000	13,000	53,000	25,000	76	43
			Extrusion.....	As extruded..	47,000	8	10	7,000	14,000	66,000	24,000	68	38
			Extrusion.....	Heat treat...	55,000	2	2	9,000	15,000	62,000	24,000	83	50
			Rolling (sheet).	As rolled.....	48,000	5	5	4,000	13,000	.....	21,000	71	41
			Rolling (sheet).	Annealed....	44,000	3.5	3.5	7,000	14,500		21,000	70	40
88% Mg 12% Al	1.820	.0657	Casting (sand)..	As cast.....	19,000	0.5	None	4,500	11,000	47,000	18,000	65	44
			Casting (sand)..	Heat treat...	24,000	1	1	4,500	10,000	49,000	21,000	64	42
			Casting (sand)..	Heat treat...	31,000	0.5	None	12,000	16,000	56,000	22,000	94	64
			Extrusion.....	As extruded..	45,000	7.5	8	10,500	15,000	72,000	24,000	71	46
			Extrusion.....	Heat treat...	45,000	1	1	13,000	16,500	67,000	27,000	90	55
			Rolling (sheet).	As rolled.....	53,000	3	2	16,000	16,000	.....	24,000	81	47
			Rolling (sheet).	Annealed....	45,000	3	3	8,000	15,500		22,000	82	47

corrosion resistance, but its immunity from attack by certain corrosives is of great value. It is entirely unaffected by alkalis of any concentration even when hot and it resists perfectly the action of hydrofluoric acid. It resists ordinary atmospheric corrosion, remaining bright indefinitely unless unusually corrosive gases are present in the atmosphere. A treatment is being perfected that promises to make magnesium and its alloys highly resistant to the attack of salt water and similar "natural" corrosives. While complete information is not available regarding this treatment, it is stated that it is similar to the Z D treatment for aluminum alloys, in which the alloy when heat-treated is quenched in a solution of sodium silicate with the result that a wear- and corrosion-resistant surface is produced.

Advantage of Low Density

Most of the applications of magnesium and its alloys have been made where the low density of the metal is advantageous. Magnesium has a specific gravity of 1.74 and with the addition of even 10 per cent aluminum it is only about 1.8. Its potential value in aircraft manufacture and for moving parts of gasoline engines was obvious from the first, and its advantages for these purposes were soon utilized. Alloys have been made with many metals. Copper, cadmium, calcium and zinc will alloy with magnesium, but for most purposes the aluminum alloys are the best. The great strength of these alloys, the readiness with which they are worked and their lightness combine to make them widely applicable. With the co-operation of the Aluminum Company of America the American Magnesium Corporation has recently completed a survey of the magnesium-base aluminum alloys in various forms. A summary of the results will be found in Table II. The figures given are general averages and indicate the range of properties of these alloys. The inexactness of the proportional limits and their increase under load should be borne in mind as in the case of pure magnesium.

In this connection it is well to remember that the strength of a beam subjected to cross stress or torsion is proportional to its section modulus, which in turn is proportional to the cube of any lineal dimension of the section. Thus where bending or twisting forces are encountered, doubling the cross-section much more than doubles the strength of the member, from which it follows that a metal as strong as steel and one-third as heavy may provide a member of the same weight and much more than three times as strong.

Magnesium alloys have been suggested for moving parts in cream separators and it is reasonable to expect that there are places in chemical engineering equipment where similar applications will be found. It is possible to make magnesium alloy parts with a tensile strength of more than 45,000 lb. per sq.in. and a density less than 1.8. The value of this material is obvious where the inertia must be low. It has been found to serve efficiently in an unusual case of this sort where conditions are extreme: in a "super-charger," a device for providing air at atmospheric pressure to aircraft motors when at a high altitude, the impeller (or fan blade) must turn at a rate of 27,000 r.p.m. and when the motor is started it must accelerate to this speed while the first six explosions take place in the motor. The shock to the impeller would be too great for a metal with even the strength of steel if its density and consequently its inertia were not very low.

Difficulties of Casting, Forging and Welding

Due to the readiness with which it oxidizes at high temperatures and its tendency to ignite at a little above its melting point, magnesium presents difficulties in casting and forging which preclude the use of these means of fabrication by the uninitiated, but with a little care it can be readily machined, welded or soldered. It machines more freely than aluminum, and cutting speeds even higher than those used in working with brass may be used. The tools should be kept very sharp, but no

lubricant is necessary. In welding with the oxy-acetylene flame and a suitable flux, no great difficulty is experienced if proper care is taken to follow the special technique that has been developed for this material. In soldering, the same difficulties are encountered as in soldering aluminum. Surface oxides make necessary extra care, and the joint is subject to corrosion in the presence of moisture.

Summing up magnesium's outstanding characteristics we find this metal to be:

A chemical reagent with which we have long been acquainted.

A metal that is extremely light and one that with a little alloying material is strong and tough.

A metal that resists the action of alkalis.

A metal that is immune to the action of hydrofluoric acid.

A metal that is readily worked.

These and a few other good qualities of lesser importance in a metal that is being produced in increasing quantities at decreasing cost provide numerous possibilities of use that are not yet apparent. It is left for the future user to discover that certain combinations of these properties may make magnesium or one of its alloys of value to him.

Treating Industrial Wastes

So That They Are No Longer Injurious Is Becoming a Legal Necessity in Most States—This Article Describes One Method of Treatment

By Frank Bachmann and E. B. Besselievre
The Dorr Co., New York City

INDUSTRIAL or trade wastes may be defined as the liquid discharge or wastes from manufacturing plants or processes and may contain solids incidental to the process. The continued discharge of these wastes into streams has given rise to a serious condition, necessitating drastic action by local, state and federal health authorities to conserve the health and well-being of the people, by requiring the treatment of the wastes as an integral part of the operation of the plant producing them. Laws governing the discharge of industrial wastes into streams have been placed upon the statute books of nearly every one of the United States and the provinces of Canada, but unfortunately the means for enforcement—that is, finances and police power—are not always adequate.

As many municipalities depend upon the streams passing through or adjacent to them for their supply of water for domestic use, it is essential that this supply be as free from pollution as possible. The presence of industrial wastes makes it necessary for the municipality to install elaborate and expensive filtration plants, to render this water safe for human consumption. Owing to the greater expense involved in handling the entire water supply, it is now recognized as logical that the industries should bear the burden of rendering their wastes harmless before discharge into the streams, because this can be done at less total cost.

In the past many industrial plants have disregarded this problem, due to the lack of power of enforcement in many states, but public health education has spread to such an extent that the treatment of industrial wastes is becoming well established as a necessary part of plant operation. Many new industrial companies are constructing plants for the treatment of their wastes simultaneously with their production plants in order to be ready properly to treat their wastes from the start.

From a paper presented at the Denver meeting of the American Institute of Chemical Engineers, July, 1924.

Characteristics of Industrial Wastes

The wastes from industrial plants vary widely from day to day, and in some from hour to hour, due to the various processes used. The variations in color depend upon the dyes used or the chemical reaction taking place. Wastes from dye-manufacturing or textile plants are mostly bright colored, while those from tanneries or other industries are muddy colored wastes. From some plants the wastes are practically colorless, appear harmless, but contain large amounts of acids or alkalis, which are a menace in water that is intended for human consumption.

Some industrial wastes contain large proportions of solids, others none. The total solids usually have very little significance, the important factors being colloidal solids, suspended solids or organic solids in solution. Wastes from textile mills and dye plants contain little solid matter, and the problem is one of color removal or neutralization, whereas wastes from glue factories, tanneries, beet-sugar mills, etc., contain very large percentages of solids in suspension, and but little color. In the latter instance the removal of the solids is the primary object of treatment.

Scope of Treatment

The type or degree of treatment required for any industrial waste depends upon several things, the most important of which are, first, the quantity to be treated; second, the use of the streams which receive the discharge; third, the proximity of residential districts, bathing places and so forth. Where wastes may be discharged directly into municipal sewer systems leading to plants for the sewage treatment, measures must frequently be taken to eliminate those constituents of the waste that would deposit in the sewers or that would destroy or inhibit the bacteria necessary to the proper functioning of the sewage-treatment plants.

Another consideration is the volume and strength of the industrial flow as compared to the municipal sewage flow. In many industrial cities the wastes from the factories equal or exceed the flow of sewage contributed by the population, and where a given waste requires treatment before final discharge, it is manifestly unfair that the municipality should bear the entire burden of treatment. The discharge of caustic and acid liquors into municipal sewers not only is detrimental to the bacterial treatment of the sewage but it is destructive to the sewers themselves, and these wastes are more economically treated before their entrance to the sewer.

Wastes Cause Great Municipal Expense

Wastes containing large volumes of readily settleable solid matter cause great expense to cities for cleaning and upkeep. An instance in mind is that of Newark, N. J., where there is a total of more than 200 miles of sewers, with one special sewer 2 miles long for a group of tanneries. The expense of keeping this short section clean is one-tenth of the entire yearly sum spent for the upkeep of the system.

Where a number of industrial plants are closely grouped, it is frequently possible to combine their

wastes and treat them all in one common plant. This tends to lessen the initial plant cost and operating cost, which may be apportioned among the users according to the volume contributed.

How Industrial Wastes Are Treated

The oldest and until recently the most used method of treatment of industrial wastes was to discharge into the nearest body of water and depend upon the dilution afforded by the larger volume of water to carry the wastes away without nuisance. Due to the growth of municipalities, their proximity, the increase in the volume of industrial wastes and the increasing demand for the use of the streams as sources of water supply, this method is quickly being discarded, except in isolated places. In some cases, however, engineers recognize that where streams cannot be considered as sources of potable water they may still be used to a certain extent as dilution sources. For instance, the State Health Department of Pennsylvania has set aside certain streams in that state into which industrial wastes may be discharged, inasmuch as these streams can never be recognized as sources of water supply for domestic consumption.

As previously mentioned, certain types of wastes contain solids that may be granular, stringy or fibrous. To illustrate: the wastes from sole leather tanneries contain large percentages of solids ranging from animal hairs and small bits of hide to grit, dirt and lime, from the washing and tanning processes. The stringy, fibrous hide or other large matters may be most readily and economically removed by mechanical means—that is, by passing the flow through a perforated screen. To prevent deposits on the banks or beds of streams or sewers, to eliminate floating scums or other nuisances, the removal of suspended solids too fine to be caught by a screen is best accomplished by sedimentation.

Sedimentation and Its Use

Where solids to be removed are all of a fine nature or are flocs produced through chemical reactions, sedimentation alone will usually produce the desired result. Sedimentation removes only those solids capable of settling in the time allowed for flowing through the sedimentation unit. The ordinary sedimentation unit is simply a tank designed to allow the flow of waste to be slowed down to a velocity that will allow the solids to settle, its size depending upon the character of the solids and the quality of the effluent or overflow desired.

Straight sedimentation, possibly preceded by screening for the coarser solids, may be used only where the effluent from the tank may be discharged without further treatment into streams that give ample dilution. In some cases screening alone may afford satisfactory treatment, especially if the wastes are to be discharged into tide water or large bodies of water not used for municipal supplies. Where very light fine or colloidal solids and color are to be removed, it is frequently more economical to resort to chemical precipitation than to provide the area necessary for straight sedimentation, and in other cases chemical precipitation is absolutely necessary to produce a clear effluent.

In the sedimentation unit the settleable solids form a sludge on the bottom of the unit and must be frequently removed if a uniformly clarified effluent is to be produced. This removal of sludge may be done periodically and manually, requiring duplicate basins and considerable expense, or continuously by mechanical means. The latter is the most economical method in the average case. Especially where chemical precipitation is resorted to, producing a heavier and more voluminous sludge, continuous mechanical sludge removal becomes the most economical method both to install and operate. Aside from the continuous operation of the unit, it produces a sludge of greater density; it permits the use of shallow units; it makes duplicate units unnecessary, and assures at all times an effluent of uniform clarity. As the sludge is removed before decomposition has begun, there is seldom any scum formation on the surface, and the odors ordinarily experienced in the older type of tanks are obviated. The operating cost is low. The mechanism, being simple, ruggedly constructed and slow moving, requires very little power and little attention.

Centrifugal Force and Electricity for Taking Colloids Out of Suspension

Recent experiments conducted in France by A. Marx and J. Rozières are said to have demonstrated the value of a new device for taking colloids out of suspension. This apparatus operates with a combination of centrifugal force and a highly charged field.

In operating on old oil with an ordinary centrifugal apparatus composed of a bowl 0.60 meter in diameter revolved at 2,700 r.p.m., the main part of colloids remained in suspension in the liquid. On the other hand, the electrical action alone was without effect. But when the liquid was submitted during 5 minutes to a simultaneous action of centrifugal force and a difference of potential of 40,000 volts, the liquid became absolutely clear.

In order to obtain this difference of potential, a direct current 110 volts ending in a 110/40,000-volt transformer is utilized. A rotative circuit breaker is placed on one terminal cutting and re-establishing the current 14,000 times per minute; the positive pole is constituted by the frame of the apparatus and the outside part of the steel bowl, and the negative pole by three copper wires isolated from the bowl and held by the winglets; their diameter is 40 cm. This device gives a motion to colloids in the two ways, the movement toward the sides being stronger.

Paper Export Position Maintained

Meeting the keenest competition ever experienced in the world's paper market, with European manufacturers quoting bottom prices in an effort to hold on to their share of the business offering in the consuming markets, the United States sold paper valued at $24,903,953 to the countries of the world during the fiscal year just closed, according to an analysis of paper exports compiled by the Department of Commerce.

Exports of paperboard and strawboard lead the classifications, being valued at $2,861,319, an increase of 13 per cent in value and 30 per cent in quantity over 1922-23. Wall paper and hanging paper, valued at $619,357, increased nearly 25 per cent. Photographic paper maintained its position with exports valued at $1,498,878. Exports of newsprint paper were valued at $1,694,321.

The 2½ per cent decline in the total paper trade for the year was scattered over the cheaper classes.

Carbonizing Coal With Regenerated Heat

Description of a New Type of Complete Gasification Plant Recently Installed at Aylesbury, England

By C. H. S. Tupholme
London, England

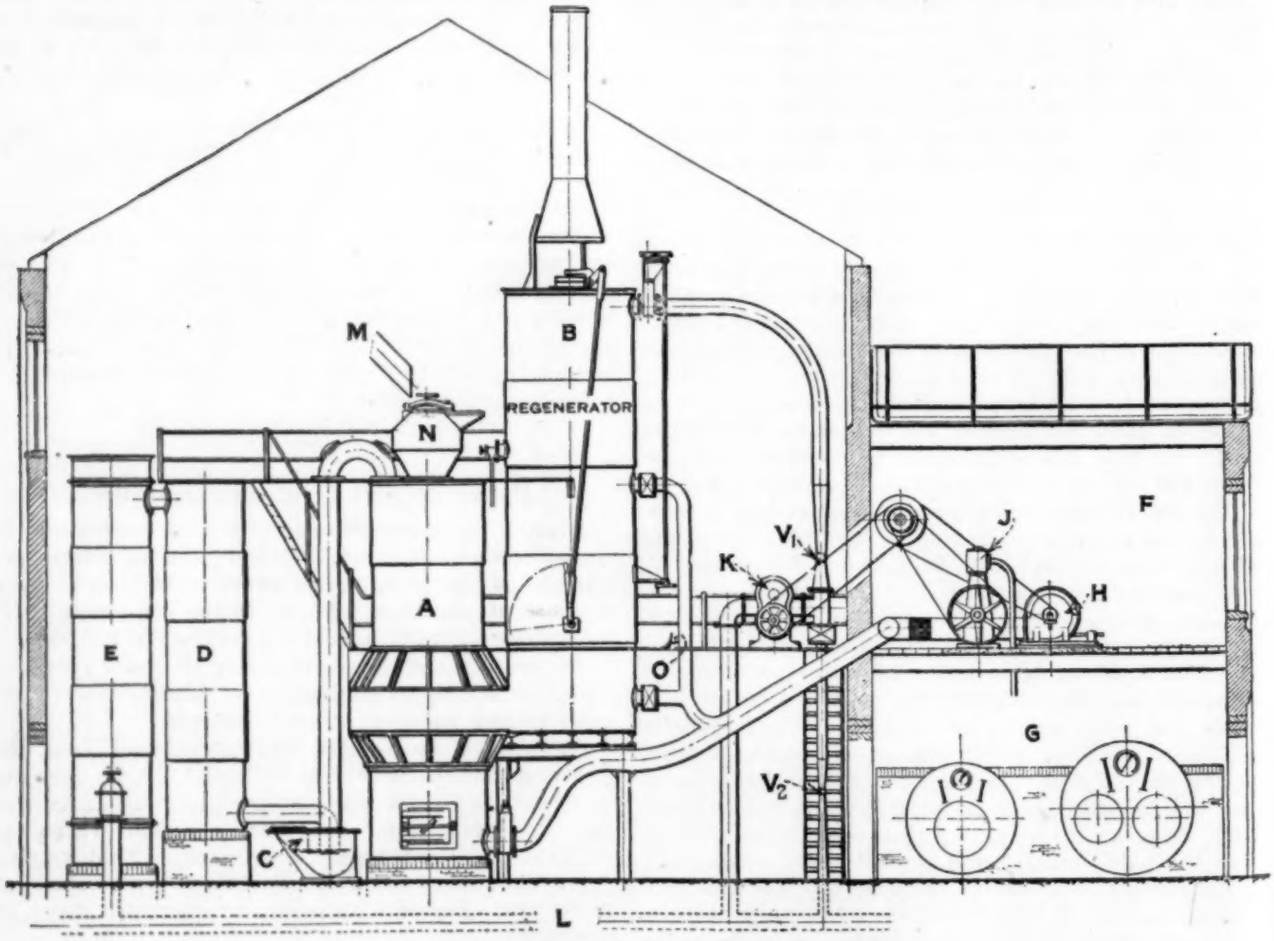
A PLANT for the complete gasification of coal, in which the fuel is converted into gas in a single operation, leaving ash, liquor and tar as residuals, in such a way that a large proportion of the potential energy of the coal is available as city gas has been installed at Aylesbury, England. Carbonization is effected by internal heating by the direct transference of the sensible heat of the gas to the coal at a sufficiently high temperature and in sufficient amount to complete the gasification process. The heat employed is recovered regeneratively from the blow or waste gases. No retorts are employed and there is no external heating of the fuel. The figure shows the general arrangement of the complete gasification plant which is designed for an output of 300,000 cu.ft. per 24-hour day.

A, which is the generator, is a steel shell lined with firebrick and insulated with slag wool. The lower part is similar to a water-gas generator, being equipped with air and steam inlets, valves and an offtake pipe for the down-run gas, all these being below the firegrate level.

The lower part of the generator is the gasification section, and in it the coke produced from the gasification of coal in the upper part of the shell is converted into water gas and blow gas by the alternate action of steam and air. The carbonization zone is continuous with the lower part of the producer and is equipped with a coal hopper *N*, a coal-feeding device, and a gas offtake pipe leading through a wash box, scrubber *D*, condenser *E*, and outlet main to the relief gas holder. Intermediate between the zones of carbonization and gasification is fitted a circular channel which communicates with the regenerator *B*. Through this circular channel the blow gas passes from the top of the gasification zone of the plant into the regenerator, without passing through the coal in the carbonization zone, and through it the heated circulation gas passes from the regenerator to mix with the water gas passing from the gasification zone to the carbonization section during the run. The circulation gas is drawn from the outlet main and is forced by the circulator into the regenerator, the gas first passing through an orifice meter, which shows on a gage the cubic feet of gas passing per minute.

Methods of Operation

The plant operates as follows: During the blow air enters under the gas producer grate, and after allowing a few seconds for scavenging the plant, the stack valve is closed. A special device insures that the valves controlling the admission of circulation gas to the



General Arrangement of the Complete Gasification Machine

A—Gas producer. *B*—Regenerator. *C*—Wash box. *D*—Scrubber. *E*—Condenser. *F*—Engine room. *G*—Boiler house. *H*—Blower. *J*—Steam engine. *K*—Circulating machine. *L*—Outlet to relief holder. *M*—Coal chute (from overhead hoppers). *N*—Coal-charging hopper. V_1—Venturi gas meter No. 1. V_2—Venturi gas meter No. 2. *O*—Operating floor.

regenerator and steam to the circulator engine and turbo blower are operated simultaneously, the speed of the circulating engine being increased and that of the blower being decreased. The rate of circulation is controlled by a valve at the inlet to the regenerator, the volume of gas circulated being read off directly on the gage referred to in the previous paragraph.

During the up run, which is the first part of each run, gas is circulated through the plant. After stopping the circulation and before beginning the down run, steam is passed through the regenerator, so as to drive the gas left in it forward into the regenerator and through the carbonization zone. The down run valve is then opened, during which the steam is preheated in the regenerator, so that at the end of the run period the regenerator contains only steam.

Rich gas, mixed with a large quantity of steam, is given off from the coal in the upper part of the plant during the blow period, the mixture being passed into the condenser, the permanent gas being drawn off through the circulator and delivered to the relief holder.

The circulator *K*, on which so much of the mechanical efficiency of the process depends, is of Sturtevant design and can handle the gas against a high resistance.

The operation of the plant, including the charging of the generator with coal, is carried out by one man without assistance. Clinkering occupies two men for 10 minutes.

Results Obtained

As the capacity of this plant, which has been operating satisfactorily for 15 months, is much in excess of the demand upon it, it has been possible to work it for only 4 to 8 hours per day. If the plant has been standing over for 18 hours it is necessary only to lengthen the first few blowing periods before getting ahead with the routine.

The longer the period of standover the greater is the amount of coke removed with the clinker before starting up, the coke being burned under the boilers.

Table I—Actual Results of a Period of 4 Months

Total days during period	115
Number of days plant in operation	104
Number of days plant shut down	11
Average hours running on working days	7½
Average hours shut down on working days	16½
Length of standover at weekend	44
Coal handled, tons	233
Gas made, cu.ft.	10,780,000
Gas made per ton, cu.ft.	46,200
Calorific value, B.t.u.	420
Therms	194
Oil used, gal.	9,380
Oil per ton of coal, gal.	40
Therms (0.7 per gallon) per ton of coal	28
Water gas burned, cu.ft.	740,000
Water gas burned per ton of coal, cu.ft.	3,176
Calorific value of water gas, B.t.u.	300
Therms per ton of coal from water gas	9.5
Coke recovered per ton of coal	0.1
Therms from coke per ton of coal	8.0
Cost of Production into Holder	
Hours operated	772
Coal used, tons	233
Gas made, cu.ft.	10,780,000
Calorific value, B.t.u.	420
Therms produced	45,276
Oil used, gal.	9,380
Operator, 96.5 shifts @ 8s.4d. per shift	£40. 4. 2
Clinkering, 32 hours @ 1s.2d. per hour	1.17.4
Boiler (0.16 ton per ton of coal), 37.25 tons of breeze @ 10s. per ton	18.12.10
Purification @ 0.58d. per 1,000 cu.ft.	26. 1. 0
9,380 gal. of oil @ 4.5d. per gal.	175.17. 6
	£262.12.10
Cost per 1,000 cu.ft.	5.85d.
Cost per therm	1.39d.

A therm is equivalent to 100,000 B.t.u.—that is, the gross amount of heat produced by the combustion of, say, 200 cu.ft. of gas having a calorific value of 500 B.t.u. The number of therms in a given volume of gas is:

$$\text{Therms} = \frac{(\text{No. of cubic feet}) \times (\text{Calorific value})}{100{,}000}$$

During the first part of the standover a certain amount of rich gas is given off from the coal in the carbonization zone; this gas is passed through the seal in the wash box into the relief holder.

In operation it is generally found convenient to enrich the gas up to 420 B.t.u. and to mix it with an equal volume of gas from intermittent vertical retorts of 520 B.t.u., the gas supplied to the town being 460 to 470 B.t.u.

The gas yields on a test arranged to be as near normal working as possible gave these results:

Total corrected gas volume, cu.ft.	575,000
Coal gasified (3.5% moisture, 6.5% ash), tons	12.1
Gas per ton of coal handled, cu.ft.	47,500
Gas per ton of dry coal, cu.ft.	49,200
Gas per ton of dry ash-free coal, cu.ft.	52,800

The average B.t.u. value of the gas during these tests was 371.5.

In designing this plant attention was concentrated on the equipment for gasifying the coal, the efficient cracking of the oil being necessarily, in the circumstances, of secondary importance. Under the most favorable conditions of continuous operation the carburetting process could be carried out fairly efficiently.

Recently a 4 months test was carried out on the plant and gave the results shown in Table I. In these calculations it is assumed that the gas from the plant would average 360 B.t.u. and the carburetted gas 420 B.t.u. over the whole period. The oil gasified works out at 0.87 gal. per 1,000 cu.ft. of gas over the whole period, so that the efficiency of carburetting is 0.7 therm per gallon. In heating up the plant rather more than three runs of water gas were burned every day, and as this gas contains some coal gas, its calorific value is taken at 300 B.t.u. per cu.ft.

Canadian Paper Industry Thriving

Another step toward the complete recovery in the pulp and paper industry of Canada from unsatisfactory conditions that prevailed during 1921 was taken in 1923, according to a report on the industry for that year prepared by the Bureau of Statistics. Taking into account the value of pulpwood exported, pulp made for export and paper manufactured, the total value of production in 1923 was $183,226,218, a betterment of $31016,507 when compared with same statistics for the previous year.

There were 110 mills in operation in 1923 as against 104 in 1922. Of these mills 43 manufactured pulp only; 32 manufactured both pulp and paper, and 35 made paper only. The 75 mills manufacturing pulp produced 2,469,305 tons, valued at $98,886,110, an increase of 319,054 tons and $13,938,512 in value. The 67 mills manufacturing paper produced 1,582,790 tons, which, with certain miscellaneous pulp products, was valued at $127,605,582, a gain of 215,984 tons and $20,519,816 in value. Newsprint made up 78.4 per cent of the total paper production in 1923, amounting to 1,241,706 tons, valued at $92,482,843, an increase of 160,342 tons and $16,511,516 in value.

The apparent total production of pulpwood in 1923 was 4,648,663 cords, valued at $57,029,212, of which 70.2 per cent, or 3,264,433 cords, valued at $43,504,208, was manufactured into pulp in Canadian pulp mills and 29.8 per cent, or 1,384,230 cords, valued at $13,525,004, was exported to the United States in the raw or unmanufactured state.

Equipment News

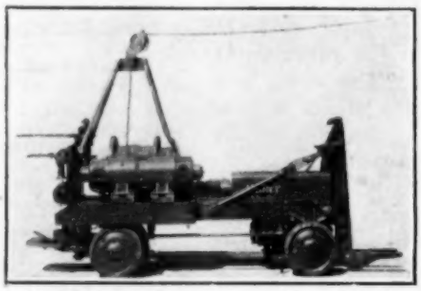
From Maker and User

New Power Source for Industrial Trucks

The illustration herewith shows a charging truck for malleable iron pot handling, which has a unique arrangement for obtaining its power. In place of the usual storage battery, there is a direct coupled Hertner motor generator set, which receives 220 volts d.c. from the trolley and delivers 24 volts to the truck motors. This generator is built compounded so that it supplies a uniform voltage regardless of the load.

In order to keep the trolley cable taut, a Haywood spring take-up reel is provided, which can be seen in the illustration directly behind and projecting above the motor generator.

This truck will pick up and carry a stack of pots weighing 6,000 lb. This method of obtaining power for a charging truck suggests that similar applications could be made in other industries where the industrial truck is used. The truck is the product of the Baker R. & L. Company, Cleveland, Ohio.



Industrial Truck Connected to Electric Trolley Line

Construction for Heating Vessels

Users of apparatus in which processes take place requiring the application of heat, such as evaporators, concentrating pans, roasting pans, stills, retorts, autoclaves, etc., will be interested in the method of construction the American rights of which have recently been acquired by the Bethlehem Foundry & Machine Co., Bethlehem, Pa.

This method of construction, called the "Original Frederking Apparatus," has been successfully used in Germany for a number of years. It consists of replacing the usual heating jacket by coils of seamless steel tubing cast into the cast-iron body of the apparatus in such a way as to form a homogeneous mass with the iron. The accompanying cut, Fig. 1, shows the construction for an externally heated vessel with an agitator and is typical of the method of construction. It is claimed for this type of construction that it does away with leaks, allows for a smooth interior, and provides for a continuous pipe of uniform diameter for the heating medium to pass through. This last advantage insures a higher rate of heat transfer through the vessel walls as compared with that of a jacketed vessel, for the heating medium travels at a much higher velocity.

This apparatus is particularly recommended by the makers for use with their hot water heating system shown in Fig. 2. This system will heat up to 662 deg. F., and is claimed to be more economical than superheated steam.

The hot water is produced in a special furnace erected near the apparatus on a lower level, as shown in the cut. The hot water produced in the heating coils of the furnace rises in the tubing up to the apparatus, owing to the reduction of its specific weight, and returns cooled to the furnace, where it is reheated.

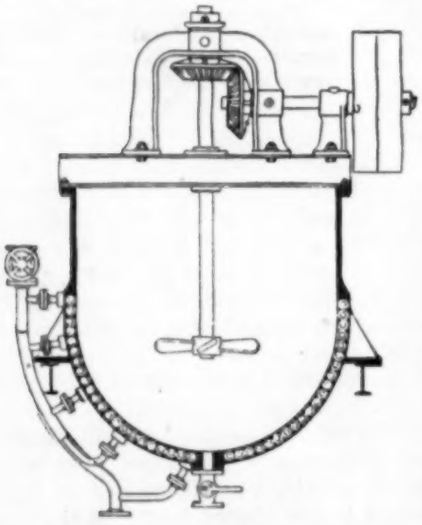


Fig. 1—Heating Vessel Built on the Design of the Original Frederking Apparatus

Portable Bucket Loader

The early designs of portable bucket loaders, placed on the market about 15 years ago, proved so successful that much has been done since then in the way of bringing out new and improved models. Among these was the so-called "Tanktred" loader, noted in these columns some time ago. Since then the Jeffrey Mfg. Co., Columbus, Ohio, which makes this machine, has added numerous improvements, a description of which follows:

The frame-work of the elevator boom is built up of wood and steel, in combination to provide great strength and elasticity. Two strands of 102-B Jeffrey Hercules chain are used to carry the buckets. The latter are 8 in. long, of malleable iron, with high backs and renewable steel digger edges. To receive the discharge from the elevator buckets, the top of the boom may be fitted with a swivel spout, to give as much as 11 ft. clearance from the ground. Or, in place of the swivel spout, a measuring, or batch hopper, with valve in the bottom, and having a capacity of about 21 cu.ft., may be substituted.

The tread proper consists of heavy steel plates, bolted to a chain made of cast-steel side bars, hardened steel knuckles and hardened steel pins, the weight of this unit being balanced about a 1¼ in. diameter pin. The tread sprockets are heavy cast steel. The thrust from the under side of the tread is taken by chilled rollers, placed in proper position. The main weight of the machine is carried on these crawlers by a three point suspension, to take care of rough and uneven ground.

The clean-up device consists of revolving spiders, having hardened steel pin inserts, and of a plate steel scoop. The heavy cast-iron spiders are brass bushed and revolve on the extension of foot shaft, which is securely braced to the boom, and through the scoop to the body of the machine. The steel pin inserts are so placed as thoroughly to loosen compact material and carry it forward into the path of the buckets. This method insures a full load in each bucket, even when working in shallow piles. The two spiders are driven independently by two chain drives from a countershaft on the boom. The driving sprockets on the countershaft are engaged by the elevator chain and are placed in such a position that should the spiders catch on some immovable object, the elevator chain will simply ride over these sprockets, making a simple but effective safety device.

All driving mechanism is mounted in a rigid steel and cast-iron self-contained frame, which in turn is mounted on the framework proper of the ma-

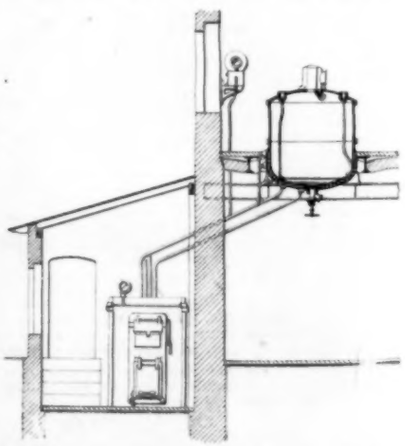
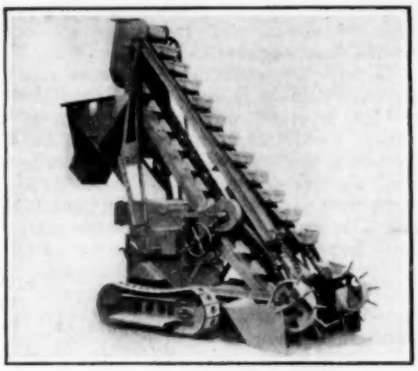


Fig. 2—Hot Water Heating System Applied to Heating Vessel



Crawler Tread Portable Bucket Loader

chine. A heavy steel shelf supports the power unit so that all gears are in line and cannot get out of proper mesh. All gears are steel with cut teeth. All bearings are bronze bushed and grease oiled, which keeps out the dirt. These parts are all interchangeable. The entire driving unit is inclosed in a steel plate housing, built up shingle effect to keep out dirt.

Operation is controlled by levers located so as to be reached by a man standing on the platform attached to one of the tread frames. Each function of the machine is completely independent of the other. Propelling, steering and operation of the elevator are accomplished through multiple disk clutches. The treads are controlled by brake mechanism on the differential shaft, making it possible to turn the machine on the center of either crawler as a pivot.

The raising and lowering device is self-retaining and automatically locks in any position. Provision is made for two speeds both forward and in reverse direction—the fast speed 50 ft. per minute, for moving the machine from pile to pile, the slow speed about 2 ft. per minute for feeding into the material.

Lubrication is taken care of by a high-pressure lubricating system. All bearings and moving parts are equipped with high-pressure fittings, so with the aid of a grease gun all parts are quickly and easily lubricated. This system, embodying the explosive action, not only forces the grease into otherwise inaccessible parts, but forces out dirt and foreign substances detrimental to the working surfaces.

Roller Hanger Bearing

The Dodge Manufacturing Corporation, Mishawaka, Ind., has recently placed on the market a new shaft hanger embodying, among several novel features, the Timken tapered roller bearing. This hanger consists of two

Fig. 1—Construction of Roller Bearing Hanger

Timken tapered roller bearings mounted on a ground and slotted steel tube and fitted into a machined housing. The ends of the steel tube are threaded to receive clamping collars designed to secure accurate adjustment of the bearings on the tube. This adjustment is made at the factory and need not be changed by the user.

The roller bearings are so mounted as to give proper service against both thrust and radial loads. The method of fastening the steel tube on the shaft, that of setting the screws in the two clamping collars, permits the use of this hanger bearing with any commercial shafting.

It is claimed that this bearing is dustproof. The sleeve on which the bearings are mounted extends from end to end of the housing. Ample grease compartments are provided inside of the housing and outside of the tube. The outer ends of the bearings are protected against dust by special metallic grease seals, that keep the dust out and the lubricant in and that, it is claimed, serve also to eliminate

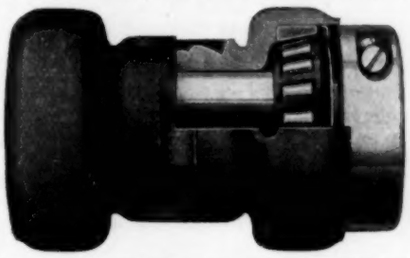


Fig. 2—Sectional View Showing Method of Assembling Hanger

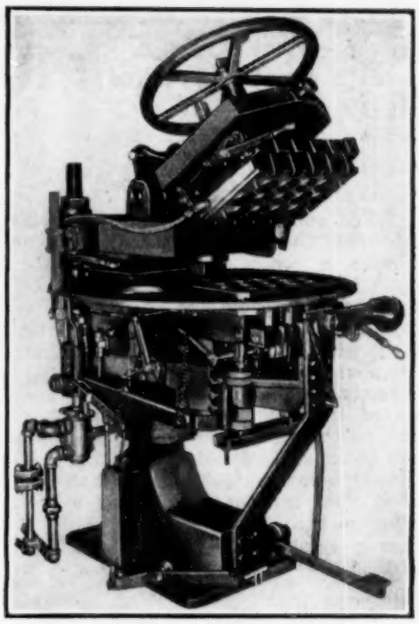
friction at this point. These seals take the place of washers or packing.

Ruggedness, simplicity, interchangeability and trouble-free lubrication are claimed for this device by its makers, who point to the particular value of this construction in resisting the side-weave of heavy driving belts.

Automatic Machine for Molding Plastics

The industry of molding parts and shapes out of such plastic materials as Bakelite, Pyroxylin and hard rubber has grown enormously of late years, particularly since the recent phenomenal sales of radio equipment commenced. This has had the effect of renewing interest in the design of molding presses for this class of work. One of recent additions to this line of equipment is the "Duo-Press," made by the Automatic Molding Press Co., 280 Passaic St., Newark, N. J.

This machine, shown in the accompanying illustration, embodies a main press, a sub-press for pre-heating and pre-pressing, a mold-gripping and separating press, a tilting-head mold exposing mechanism, four chambered jackets adaptable to various combinations of heating and cooling, means for moving the lower mold plate and substituting ejector pins, and an automatic conveyor. The machine is automatic, functioning without the operation of any steam valves by the operator. It is claimed to be simple, powerful and safe in operation and to give



Automatic Molding Press

maximum output at lowest cost. Among the various advantages which the manufacturers claim are the following:

a. It permits the separating, loading and unloading of one set of molds while a second set is under final pressure and curing, thus assuring an increased production.

b. The powerful main press (having a capacity of 127 tons) is kept in constant pressing action, because no time is lost in separating, unloading, cleaning, reloading and lifting the molds in and out of the press.

c. Its automatically operated turntable simultaneously transposes the two-mold units. This simple mechanical conveyor has done away with the laborious manual conveyance of the molds from one press or place to another.

d. It obviates the danger of damage to the molds or dies as well as the labor connected with manually lifting or handling the molds or dies outside the press. It entirely eliminates the danger of cutting off the fingers and hands of operators resulting from the general necessity of having to put the hands between the movable platens of the old-style press.

e. Because of the foregoing advantages, one Universal Duo-Press will turn out in a given time as many articles of a superior quality of the same size as four old-style presses. This calculation is based on each of the molds in the press having only twice as many cavities as those in an old-style press.

f. For a given output a Duo-Press equipment will cost less than an equipment of old-style presses with their auxiliary machines and devices.

Manufacturers' Latest Publications

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Bulletin 1461. A new bulletin on the "Superior" McCully Gyratory Crusher for fine reduction.

Cleveland Crane & Engineering Co., Wickliffe, Ohio—A folder on Cleveland cranes for mill and yard service.

Review of Recent Patents

Light Soda Ash

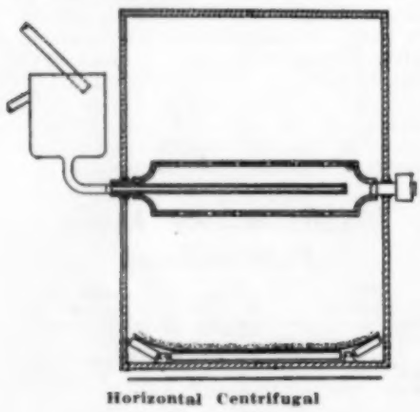
When sodium bicarbonate is heated for some time at 100 deg. C. there is formed a compound having the formula $Na_2CO_3.3NaHCO_3$ and the physical form of fine needle-like crystals. Herbert E. Cocksedge, of Hartford, England, who discovered this intermediate compound, has also found that these crystals, once formed, may be converted into sodium carbonate without loss of their physical form. The soda ash obtained is a light fluffy mass, its density being materially less than that of sodium carbonate produced by the usual methods. (1,503,48, assigned to Solvay Process Co., New York, Aug. 5, 1924.)

Arsenates Direct From Ore

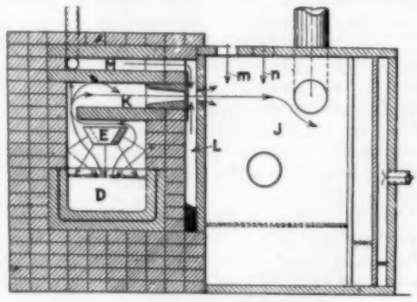
Direct production of a soluble arsenate from native ores in which the arsenic is present as arsenate has been suggested by James G. Lamb, of Denver, Colo. Pulverized ore is mixed with caustic soda (8 parts ore to 3 parts NaOH as hot 50 per cent solution). The thin paste sets to a porous solid mass that is leached with hot water to give a solution of sodium arsenate. To this, slaked lime in an emulsion form is added to precipitate calcium arsenate. As the calcium arsenate is thus formed directly from the ore without white arsenic as an intermediate step, the formation of poisonous gases and irritating dust is avoided. (1,504,627, assigned to American Smelting & Refining Co., New York, Aug. 12, 1924.)

Centrifugal for Making Finely Divided Pitch

For comminuting fusible materials such as pitch and resin, Richard Mackay, Jr., of Riverside, Ill., has found a horizontal type of centrifugal more effective than the vertical. Melted pitch flows through a pipe to the interior of a rapidly rotating horizontal perforated cylinder. The drops of material solidify in falling to the conveyor that forms the floor of the chamber. Less floor space is required with this type of construction; it is easier to collect the finished material and to provide effective cooling means. It has been found in practice that, for example, when pitch of about 250 deg. F. melting point is used, shot of a size that will pass through a 20-mesh screen may be produced with a centrifugal machine having a diameter of 8 in. and perforations of ¼ in. when driven at a speed of about 2,000 r.p.m. (1,503,960, assigned to The Barrett Co., Aug. 5, 1924.)



Horizontal Centrifugal



Electric Zinc Oxide Furnace

Colloidal Titanium Pigment

Metatitanic acid formed by hydrolysis of titanium sulphate is filtered, neutralized and washed free of sulphate. It can then be peptized by the addition of hydrochloric acid, titanium chloride or silicon chloride. For example, 20 grams of concentrated HCl will peptize 1 kg. of TiO_2. The fluid mass is dried for use as pigment, the presence of colloidal particles increasing its value for this purpose. As the degree of dispersion depends upon the amount of peptizing agent added it is possible to vary the character of the pigment. (1,504,673, Joseph Blumenfeld, London, England, Aug. 12, 1924.)

Electric Zinc Oxide Furnace

John Thompson, of Brooklyn, and Francis A. J. FitzGerald, of Niagara Falls, N. Y., produce zinc oxide in an electric furnace as follows:

Molten zinc is fed into a rectangular tank *D* above which is placed a zigzag carbon resistor *E*. A carbon plate *K* prevents upward radiation of heat from the resistor and also forces all zinc fume to impinge on the roof plate, effecting an even diffusion of temperature. To prevent the formation of the usual crust at the mouth of the nozzle through which the fume enters the oxidizing atmosphere, passages *M* and *L* are provided. Through these nitrogen, carbon monoxide or other inert gas is fed and seems to form a protective band around the fume as it enters the chamber *J*. The small amount of crust that may form on the furnace port while the furnace is being brought up to temperature may be removed by a scraper sliding over the mouth of the port. In the precipitating chamber *J*, air is admitted through openings *m*, *n*, and the oxide collects in the bottom of the chamber.

It will be noted that the tank *D* is double-walled. It has been found that as the level of molten zinc is lowered the exposed inner surface of the tank becomes subject to uneven expansion and develops cracks. By setting the bath-tank inside another tank and filling the space between the zinc oxide and granular iron, the cracks cause no trouble. The zinc oxide acts as a heat-insulator and the iron reacts with any molten zinc that leaks through to form a viscous, putty-like paste that will stop leaks even should the outer tank became fractured. (1,503,564, Aug. 5, 1924.)

Commercial Products From Blood

Solid or moldable products have been made from blood by Frederick W. V. Fitzgerald, Caversham, England, by the following process.

Defibrinated blood is dehydrated by heating from 17 to 30 hours at 115 to 120 deg. F. The dehydration should be carried to such a point that coagulation to a stiff jelly can be effected in from half an hour to 2 or 3 hours by the addition of about 2 to 4 per cent of 40 per cent formaldehyde. When the blood has been dehydrated to the above-specified degree, the desiccation is then continued at the same temperature, either in vacuo or with as little exposure to the atmosphere as is conveniently practicable, until a solid residue is attained. This residue is then pulverized and agglomerated by heat and pressure or is incorporated with other materials in any suitable manner. (1,504,225, Aug. 12, 1924.)

Concentrated Nitric Acid

In producing concentrated nitric acid by mixing water or dilute nitric acid with liquid nitrogen oxides in the presence of oxygen, it is necessary either to effect the oxidation under pressure or to use an excessive amount of nitrogen oxides.

In the latter case two layers of liquid are produced, the upper consisting of a homogeneous mixture of nitrogen oxides and nitric acid without water and the lower consisting of nitric acid of 80 to 90 per cent which is saturated with nitrogen oxides. For the production of concentrated nitric acid the use of the upper, non-aqueous layer of liquid appears to be the most expedient method, the lower layer being then separated and the nitric oxides contained in the upper layer being expelled, so that the concentrated nitric acid remains, while the lower aqueous layer is further treated with nitrogen oxides and oxygen. It is this process that has been used up to the present time.

This process, however, involves the drawback that a large quantity of the nitric acid evaporates together with the nitrogen oxides.

Einar Bergve, of Skoien, near Christiania, Norway, has discovered that the oxidation takes place principally in the non-aqueous layer of liquid. Experiments that have been made on the basis of this observation have

proved that it is more advantageous to let the upper, non-aqueous layer of liquid return to the process to act upon new quantities of water or dilute nitric acid respectively and oxygen while the aqueous layer, containing a highly concentrated nitric acid of 80 to 90 per cent concentration, is removed and if required further treated by known methods to produce acid of a still higher concentration.

The cost of further concentrating this acid to a commercial product of 94 to 97 per cent is negligible compared with the above-mentioned drawback involved by the use of non-aqueous liquid.

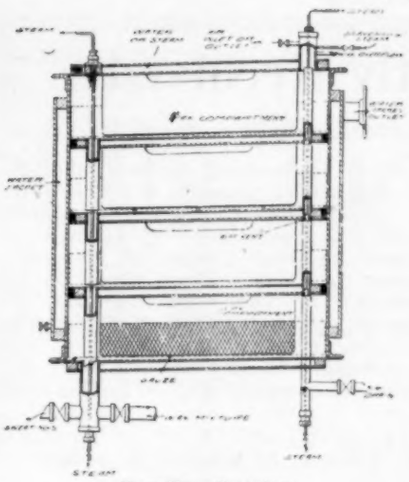
The process is as follows:

Dilute nitric acid and liquid nitric oxides are supplied to a tower filled with quartz. Oxygen is introduced at the bottom of the tower, from where the reaction product flows into a vat and is separated into two layers. The upper, non-aqueous layer is pumped into the tower again while the lower layer is drawn out and subjected to further treatment. (1,503,259, assigned to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway, July 29, 1924.)

Crystallizing and Sweating Paraffine

Uniform temperature regulating during the crystallizing and sweating of paraffine is claimed by Hugh L. Allan and James Moore, of Burmah, British India, for their new design of sweating chamber.

The apparatus is a vertical cylinder divided horizontally into a number of wax compartments. There are water jackets around the outside of the shell between the compartments, and



Paraffine Sweater

also a series of four hollow elements hanging vertically in each compartment and forming part of the jacket system. Within each compartment is a gauze form for supporting wax during sweating. The vertical heating elements are covered with gauze and a vertical strip of gauze is centered between each pair of these elements.

The whole apparatus having been heated by circulating hot water through the jackets, paraffine is run in until the compartments are full. The temperature of the circulating water is then reduced, chilling and crystallizing the wax. Solidified wax is steamed out of the drain pipes and the circulating water heated to produce sweating. At the completion of this operation, the remaining paraffine is melted by using hotter water or steam. (1,504,923, assigned to Burmah Oil Co., Ltd., Glasgow, Aug. 12, 1924.)

U. S. Patents Issued August 26, 1924

Treatment of Emulsions. Walter Broadbridge and Edwin Edser, London, England, assignors to Minerals Separation, Ltd., London, England.—1,505,944.

Rotary Pump. William F. Traudt, Buffalo, N. Y., assignor to Taber Pump Co., Buffalo, N. Y.—1,505,982.

Film Evaporator. Burton S. Hughes, Buffalo, N. Y., assignor to Zaremba Co., Buffalo, N. Y.—1,506,001.

Cane-Crushing Apparatus. Henry Hurter, St. Louis, Mo., assignor to Fulton Iron Works Co., St. Louis, Mo.—1,506,002.

Thermocouple Manometer. Kazuo Kambayashi, Kuze-gun, Japan.—1,506,003.

Water-Resistant Glue. Alfred C. Lindauer and George M. Hunt, Madison, Wis., dedicated, by mesne assignments, to the Citizens of the U. S. of America.—1,506,013.

Filter. Charles L. McCarty, East St. Louis, Ill., assignor, by direct and mesne assignments, of one-sixth to William H. Horner and one-sixth to Robert W. Sikking, both of East St. Louis, Ill.—1,506,019.

Apparatus for the Steam Milling of Vegetable Substances. Charles R. Mabee, Buffalo, N. Y.—1,506,023.

Manufacture or Treatment of Threads of Artificial Filaments. Henry Dreyfus, London, England.—1,506,052.

Metallurgy of Tin. Colin G. Fink, Yonkers N. Y., assignor to Guggenheim Brothers.—1,506,053.

Casein Sized and Method of Producing Same. Adrien E. Regnier, Revere, Mass., assignor of one-half to Reginald W. Bird, Framingham, Mass.—1,506,081.

Process for production of Aluminum Chloride and Other Products From Carbonaceous Shales and Like Material. Edison R. Wolcott, Los Angeles, Calif., assignor, by mesne assignments, to Texas Co., New York, N. Y.—1,506,104.

Treating Petroleum Oils. Robert N. Donaldson and Ross McCollum, Bakersfield, Calif., assignors to Standard Oil Co., San Francisco, Calif.—1,506,115.

Method of Preparing Siliceous Material. Francis X. Govers, New York, N. Y.—1,506,118.

Apparatus for the Exchange of Heat. James M. Harrison, Cleveland, O.—1,506,121.

Mixer. Frank X. Lauterbur, Sidney, O.—1,506,128.

Furnace Retort. Charles H. Smith, Short Hills, N. J., assignor to International Coal Products Corp., Richmond, Va.—1,506,140.

Process of and Apparatus for Making Gas. Walter C. Dayton, Rutherford, N. J., assignor to General Oil Gas Corp., Bristol, Va.—1,506,164.

Furnace Retort. John W. McLaughlin, Fairmont, W. Va., and George H. Gell, South Clinchfield, Va., assignors to Clinchfield Carbocoal Corp., Bristol, Va.—1,506,188.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers. They will be studied later by "Chem. & Met.'s" staff, and those which, in our judgment, are most worthy, will be published in abstract.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Electric Cell Containing A Salt Inhibiting the Production of Gas. Anna A. MacKenzie, Fremont, O., assignor to National Carbon Co., Inc.—1,506,189.

Stabilized Glauconite and Method of Making Same. Carl H. Nordell, Fort Wayne, Ind., assignor to Wayne Tank & Pump Co., Fort Wayne, Ind.—1,506,198.

Casein Glue. Henry L. Prestholdt, Minneapolis, Minn.—1,506,201-3.

Evaporating Apparatus. Louis B. Castets, Benejacq, France.—1,506,218.

Centrifugal Atomizer. Samuel M. Dick, Minneapolis, Minn.—1,506,226.

Suction Gas Producer for Gasifying Sawdust and Like Fuels. Harold Dormand, Bayonne, N. J.—1,506,227.

Manufacture of Alkyl, Aralkyl and Aromatic Compounds. Henry Dreyfus, London, England.—1,506,228.

Process for the Production of Cyanides. Foored Von Bichowsky and John Harthan, Glendale, Calif.—1,506,269.

Electric Furnace. Thaddeus F. Baily, Alliance, O.—1,506,281.

Acid-Proof Tank or Container. Ferdinand F. Brucker, Akron, O., assignor to Miller Rubber Co., Akron, O.—1,506,288.

Process of Making Sulphur Dioxide. Charles S. Hollander, Philadelphia, Pa., asignor to Rohm & Haas Co.—1,506,301.

Pyrazolone Dye and Process of Making Same. Eugene A. Markush, Jersey City, N. J., assignor to Pharma-Chemical Corp.—1,506,316.

Method of Making Rubberized Parchment Paper and the Product Thereof. Thomas C. Marshall, Yarklyn, Del., and James L. McClellan, Kennett Square, Pa.; said McClellan assignor to said Marshall.—1,506,317.

Bituminous Composition. Lester Kirschbraun, Evanston, Ill.—1,506,371.

Process of Making Flotation Oil. Frederick H. Rhodes, Philadelphia, Pa., assignor to The Barrett Co.—1,506,385.

Gear-Actuated Valve. Paul W. Knauf, Cynwyd, Pa., assignor to Schutte & Koerting Co., Philadelphia, Pa.—1,506,433.

Process of Refining Oil. Daniel Pyzel, Piedmont, Calif.—1,506,444.

Preparing Arsenobenzene Derivatives Which are Stable in Solution. Karl Streitwolf, Frankfort-on-the-Main, Germany, assignor to Farbwerke vorm. Meister Lucius & Bruning, Hochst-on-the-Main, Germany.—1,506,460.

Classifier for Milled Products. Lycurgus Lindsay, Los Angeles, Calif.—1,506,494.

Method of Joining Pulpboard. Daniel M. Sutherland, Jr., Trenton, N. J., assignor to Agasote Millboard Co., Ewing Township, Mercer Co., N. J.—1,506,509.

Azodyestuffs Insoluble in Water and Process of Making Same. Arthur Zitscher, Offenbach-on-the-Main, Germany, assignor to Corp. of Chemische Fabrik Griesheim Elektron, Frankfort-on-the-Main, Germany.—1,506,514.

Process of Purifying Graphite. Max Langheinrich, Munich, Germany, assignor to Graphitwerk Kropfmuhl A. G., Munich, Germany, Bavaria, Germany.—1,506,537.

Perylentetracarboxylic Acids and Their Derivatives and Process of Making Them. Maximillian P. Schmidt and Wilhelm Neugebauer, Biebrich-on-the-Rhine, Germany, assignors to the Firm Ralle & Co., Aktiengesellschaft, Biebrich, Rhine, Germany.—1,506,545.

Valve. Olaf E. Oleson, East Chicago, Ind.—1,506,546.

Method of Converting Zinc Powder Into Fluid Zinc. Edward S. Berglund, Djursholm, Sweden.—1,506,609.

Method of Making Lead Peroxide. Max Grunebaum, New York, N. Y.—1,506,633.

Process of Exsiccating or Concentrating Solutions. Georg A. Krause, Munich, Germany, assignor to the Firm Eduard Greutert & Cie., Basel, Switzerland—1,506,647.

Drying Apparatus. Gerald A. Lough, Plainfield, N. J.—1,506,650.

Portable Auxiliary Pump. Harry Maker, Milwaukee, Wis., assignor of one-half to Philip A. Koehring, Milwaukee, Wis.—1,596,652.

Feeding Device for Gas Producers. Charles A. Schranz, Philadelphia, Pa., assignor to Walter Wood, trading as R. D. Wood & Co., Philadelphia, Pa.—1,506,672.

Method of Manufacturing Nitrotartaric Acid. Arthur Lachman, San Francisco, Calif., assignor to National Aniline & Chemical Co., Inc., New York, N. Y.—1,596,728.

Books Recently Received

A.I.C.E. Papers

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Vol. XV, Part I, 1923. 405 pages, illustrated. Published by the Institute and for sale by D. Van Nostrand Co., New York. Price, $5.

Fourteen papers presented at the Richmond meeting, December, 1922, and at the Wilmington meeting, June, 1923, will be found in this volume.

Non-Ferrous Metallurgy

JOURNAL OF THE INSTITUTE OF METALS, Vol. XXXI, 1924. Edited by *G. Shaw Scott, M.Sc.*, secretary. 680 pages, illustrated. Published by the Institute at 36 Victoria St., London, S. W. 1.

This volume contains the Second Autumn Lecture, "The Use of Non-Ferrous Metals in Engineering," by Lieutenant-Colonel Sir Henry Fowler, K.B.E., delivered at Manchester, Sept. 10, 1923, and also fourteen papers presented at the annual general meeting, March, 1924.

Fabric Waterproofing

WATERPROOFING TEXTILE FABRICS. By *Herbert T. Pearson*, formerly research chemist, Bradford Dyers Association, Ltd.; general manager, Cravenette Co. 112 pages, illustrated. Chemical Catalog Co., New York. Price, $3.

Because of the very limited literature available on the subject of waterproofing textile fabrics, this book will be most welcome. Information is given regarding formulas and processes, most of which has never before been published. Rubberized fabrics are not treated, but details are given for all other methods for making cloth water-resistant. There is also included a bibliography of processes and formulas for waterproofing textiles patented in the United States, Great Britain, France and Germany since the year 1900.

Varnishes

VARNISHES AND THEIR COMPONENTS. By *Robert Selby Morrell*, research chemist. Mander Bros., Wolverhampton, England. 361 pages, illustrated. Oxford University Press, American Branch, New York. Price, $8.35.

The object of this book is to present a comprehensive summary of recent advances in the study of varnishes and their components. The various oils, resins, bitumens and solvents are considered in detail, followed by a discussion of oil varnishes, spirit varnishes and insulating varnishes.

Ammonia Stills

THE DESIGN AND WORKING OF AMMONIA STILLS. By *P. Parish*, manager, chemical works, South Metropolitan Gas Co., Ltd., 300 pages, illustrated. Ernest Benn, Ltd., London. Price, 40 shillings.

This book covers the fundamental principles underlying the design of stills, preheaters, condensers, dephlegmators, coolers, etc., with special reference to heating economy and the utilization of potential heat. It foreshadows a rearrangement of equipment for the manufacture of sulphate of ammonia, and it aims at conveying new conceptions which should be of value. Practical operating data are given on the manufacture of ammonia liquor, carbonate of ammonia and ammonia-soda. Chemical engineers and operating men will find the book of great interest.

Charts of Chemical Reactions

CHARTS OF THE CHEMICAL REACTIONS OF THE COMMON ELEMENTS. By *John A. Timm*, instructor in chemistry, Yale University. 81 pages. John Wiley & Sons, New York. Price, $2.

To aid in reviewing the chemistry of certain elements, their common reactions have been arranged in chart form. Thirty-one elements have been treated in this way, the reaction being presented in chart form followed by a list of the complete equations covering these reactions.

Storage Batteries

STORAGE BATTERIES: A General Treatise on the Physics and Chemistry of Secondary Batteries and Their Engineering Application. By *George W. Vinal*, physicist, Bureau of Standards. 402 pages, 156 illustrations. John Wiley & Sons, New York. Price, $4.50.

In preparing this volume emphasis has been placed on the scientific principles involved, without, however, permitting the text to become so technical as to restrict its usefulness. Descriptions of particular makes and types of batteries have been subordinated. The physical and chemical properties of the materials used in constructing storage batteries are discussed in so far as they relate to battery performance, and a general description of the methods of manufacture is given. Special attention is devoted to electrolyte and the rôle that it plays. The chapter on application describes only the principal uses of storage batteries. A description of the various kinds of service and the types of batteries for each is followed by a statement of the work that the battery has to do and a few records of performance so far as they are available.

Specific Heats of Gases

THE SPECIFIC HEATS OF GASES. By *J. R. Partington* and *W. G. Shilling*. 252 pages, illustrated. Ernest Benn, Ltd., London. Price, 30 shillings.

Industrial processes involving the use of gases are quite common, and in practically all the heat capacity of the working fluid is an extremely important item. The authors point out that in furnace operation the importance of the heat capacity of the air, fuel gas and flue gas involved is often not realized, and show that by selecting at random from uncriticised results for the values of specific heat from blast-furnace gas, an error equivalent to 436 tons of coal per annum may be involved in drawing up the heat balance for a single furnace. The book represents the first serious attempt to correlate critically such data as exist on the specific heat of gases. The book is not designed for elementary students, but for the expert who is in search of accurate data for application to specific practical problems.

Metallurgy

THEORETICAL METALLURGY. By *Reginald Scott Dean*, Met. E., chief, metallurgical department, Hawthorne Works, Western Electric Co., Inc. 246 pages, illustrated. John Wiley & Sons, New York. Price, $3.

In considering a second edition of his translation of Schenk's "Physical Chemistry of the Metals," Mr. Dean found that adequate revision would leave very little of the original text. Accordingly the revision has been brought out under a new title to indicate the somewhat broader field covered. The book does not claim to be comprehensive, but does aim to be suggestive.

MODERNE METALLKUNDE IN THEORIE UND PRAXIS. By J. Czochralski, oberingenieur. 292 pages, 298 illustrations. Julius Springer, Berlin. Price, $2.85.

Theory and practice of metallurgy are treated from the modern viewpoint of the physicochemical principles involved, emphasis being placed on nonferrous metals and alloys.

DIE THEORIE DER EISEN-KOHLENSTOFF-LEGIERUNGEN. By *E. Heyn*, edited by *Prof. Dipl-Ing. E. Wetzel*. 200 pages, 103 illustrations. Julius Springer, Berlin. Price, $2.90.

Studies which Heyn intended to use as the basis for Vol. IIB of his "Handbuch der Materialienkunde für den Maschinenbau" have been edited by Professor Wetzel.

DIE LEGIERUNGEN IN IHRER ANVENDUNGEN FUR GEWERBLICHE ZWECKE. By *A. Ledebur*. Sixth revised and enlarged edition, edited by *Prof. O. Bauer*. 424 pages, 154 illustrations. M. Krayn, Berlin. Price, 20 marks.

Advances in metallurgical knowledge since the appearance of the fifth edition of this book in 1919 have made desirable the preparation of a new edition of this practical treatise.

Coal Carbonization

COAL CARBONIZATION. By *Horace D. Porter*. 442 pages, 175 illustrations. Chemical Catalog Co., New York. Price, $6.

This book is distinctly a chemical engineer's study of the coal carbonization industry. Because of their reactive importance, coking and gas making at high temperatures are the subjects that receive attention. The recent developments of low-temperature carbonization are, to use the author's own words, "treated fairly and with an open mind, but not with undue enthusiasm nor a disproportionate allotment of space." While the chemical and physical fundamentals have not been neglected, emphasis has been placed on chemical engineering consideration for the purpose of making fully clear the methods of large-scale industrial application.

News of the Industry

Summary of the Week

Chemical Warfare Service reserve officers in Second Corps area plan Defense Day program in New York.

Rensselaer Polytechnic Institute is to observe centennial with appropriate ceremonies, including addresses by eminent engineers and educators.

Representatives of paper industry meet with forest research body to view historic Harvard forest at Petersham, Mass.

Dr. Edward Hart to be honored at 3-day intersectional meeting of American Chemical Society to be held in Easton, Pa., Oct. 16 to 18.

First Southern Exposition, in which it is expected thirteen states will participate, is to be held in New York in January, 1925.

Exports of chemical products in July show a loss of 17 per cent and exports a loss of 28 per cent as compared with July, 1923.

Agreement to allot American requirements of potash between French and German producers will be investigated by Department of Commerce.

Importers of nitrite of soda file brief to test validity of flexible provisions of tariff law.

Foreign Potash Agreement to Be Investigated

An investigation of the recent agreement between producers of potash in Germany and those of Alsace has been ordered by Secretary of Commerce Hoover. The investigation will be conducted under the authority of the law providing for investigations of foreign monopolies and manipulations calculated to enhance unduly the price to American consumers of commodities produced largely abroad.

There is some difference of opinion as to whether or not the agreement will result in increased prices for potash in the United States. It is known that the European producers are particularly anxious to do nothing that will stimulate prospecting for potash in the Southwest. They realize, just as do American geologists, that the prospects favor the ultimate discovery of potash deposits in that region, where the formation is particularly favorable to its occurrence. Nothing could do more to insure the passage of the Shephard bill than the arbitrary increase of potash prices following the German-French accord. The Shephard bill provides for the expenditure of $500,000 of federal funds for potash prospecting.

The German-French agreement has divided the American trade between the mines of the two countries. The agreement provides that German mines are to furnish 62½ per cent of the American requirements. The remainder is to come from Alsation properties.

Regardless of the action that may be taken in regard to prices, Secretary Hoover obviously does not like an agreement that arbitrarily assigns a certain proportion of the output of individual districts to the United States. Whether or not the price increases at this time, it very evidently could be done were it regarded good policy.

In addition to developing supplies of our own, the United States has a weapon to which it may resort in its own protection, Secretary Hoover points out, if Congress will approve of legislation authorizing consumers to buy through a common agency.

Chemical Warfare Service Plans for Defense Day at New York

The reserve officers of the Chemical Warfare Service of the Second Corps area have completed plans for carrying out the spirit and purpose of Defense Day on Sept. 12. Headquarters will be at 280 Madison Ave., New York City, where plans for mobilization and industrial preparedness will be presented during the day. It is expected that the reserve officers will engage in an informal discussion of their probable duties in time of emergency.

A dinner will be held at the Harvard Club at 7:30 p.m. to which all of the reserve officers in the Second Corps area and a number of prominent civilians identified with the chemical industry have been invited. At this dinner further discussion will be held on the general subject of chemical defense plans. Dr. Charles H. Herty, president of the Synthetic Organic Chemical Manufacturers Association, will preside at the dinner. Lieutenant-Colonel Frederick Pope, Officers Reserve Corps, Chemical Warfare Service, who is civilian chief of the New York district, is chairman of the dinner committee. No formal program has been made, but it is hoped that as a result of the enthusiasm aroused at the meeting a permanent organization will be effected of the Chemical Warfare Service reserve officers in this corps area. Plans are also under consideration to establish in each large chemical plant in this area a commissioned officer in the reserve corps of the Chemical Warfare Service.

Among those who have been invited to the dinner and who are expected to attend are: Major-General Robert L. Bullard, Commanding General, Second Corps area; Irenee du Pont, of E. I. du Pont de Nemours & Co.; M. C. Whitaker, of the U. S. Industrial Alcohol Co.; E. F. Price, of the Union Carbide Co.; W. M. Vermilye, of the National Aniline & Chemical Co.; E. H. Killheffer, of the Newport Chemical Works; H. C. Parmelee, president of the American Electrochemical Society; F. J. Metzger, president of the Chemists Club; C. E. Adams, of the Air Reduction Co.; G. A. O'Reilly, of the Irving National Bank; Joseph H. Choate, Jr.; C. P. Townsend; L. H. Baekeland, president of the American Chemical Society; Charles L. Reese, president of the American Institute of Chemical Engineer; H. E. Howe, editor, *Industrial & Engineering Chemistry;* G. P. Adamson, General Chemical Co.

Believe British-German Dyestuff Agreement Will Be Effected

British objection to commercial accords between France and Germany has led to the allegation from French sources that there is every reason to believe the British fully expect to carry into effect the agreement between the British dyestuffs corporation and the German cartel. The French contend that during the discussion of dyestuffs in connection with the Dawes plan, the British showed little interest and were in no way disposed to seek to impose regulations on German dyestuff production. They discouraged the granting of safeguards for the industries in other countries.

Columbia Offers Option to Shorten Engineering Courses

Modifications adopted by the Schools of Mines, Engineering and Chemistry of Columbia University make it possible for the student to obtain his degree in 5 years instead of 6, according to an announcement by Dean George B. Pegram. Pre-engineering training may be completed in 2 years instead of 3.

The changes, Dean Pegram explained, add flexibility to the admission requirements but do not alter the 3-year professional engineering course. Columbia, he makes plain, is committed to the longer type of engineering education.

"Since 1914," says Dean Pegram's statement, "Columbia University has conducted its engineering schools, known as the Schools of Mines, Engineering and Chemistry, as professional schools of the university type, requiring for admission not less than 3 years of undergraduate collegiate study. Up to the present, the majority of the students entering the advanced 3-year courses in the Schools of Mines, Engineering and Chemistry have come in through the 3-year pre-engineering course in Columbia College, the undergraduate college of the university.

"It is now announced that the Columbia authorities have approved a modification of the admission requirements under which a student entering Columbia College with credits in elementary physics and chemistry and advanced mathematics may, on completion of a prescribed course covering only 2 years and a summer session, be admitted to the Schools of Mines, Engineering and Chemistry.

Five-Year Course Possible

"Hitherto the shortest possible time for completing the pre-engineering preparation has been 3 years. Hence the new arrangement will make it possible for a student to be graduated with an engineering degree in 5 years instead of 6. As compared with the regular 3-year pre-engineering course, this shortened course is somewhat heavier in hours per week and contains exactly the same scientific studies and approximately one-half year's less work in modern language and general elective subjects.

"Students taking the regular 3-year pre-engineering course exercise the professional option in Columbia College and receive the A.B. degree on the completion of the first year in the Engineering School.

"Students taking the shortened pre-engineering course will not be eligible for the A.B. degree under the professional option, and the faculty has therefore voted to award the B.S. degree to these students at the end of their fourth year—that is, at the end of the second year of the regular 3-year professional course in engineering. Thus a student taking this course will not be penalized by having to wait 5 years before receiving his first degree.

"The student will obtain the professional engineering degree in one year beyond his B.S. For certain students, some of whom cannot afford the complete course and others of whom may well be advised not to go further than 2 years in the engineering course, this intermediate degree of B.S. is well suited.

"These changes in the direction of greater flexibility in the admission requirements are not accompanied by any changes whatever in the 3-year professional engineering courses in the Schools of Mines, Engineering and Chemistry. They simply provide as an alternative to the present plan of an A.B. degree in 4 years and an engineering degree in 6 that the student in more strictly prescribed courses may receive a B.S. degree from the engineering school in 4 years and the higher engineering degree in 5 years."

Southern Exposition to Be Held in New York

Below the Mason and Dixon line preparations are actively under way for the first Southern Exposition which is planned to be held from Jan. 19 to 31, 1925, at Grand Central Palace, New York City. The exposition will be of considerable interest to many of the chemical engineering industries in that the exhibits of such raw materials as non-metallic minerals have a definite appeal to many chemical manufacturers.

To date the Governors of thirteen Southern states have signified their interest in the venture. E. Lee Trinkle, Governor of Virginia, has been appointed honorary president of the exposition, while the Chief Executives of North Carolina, South Carolina, Georgia, Alabama, Mississippi, Tennessee, Louisiana, Arkansas, West Virginia, Florida, Maryland and Texas have been oppointed honorary vice-presidents. The active president is William G. Sirrine, of Greenville, S. C. Colonel Joseph Hyde Pratt, of Asheville, N. C., widely known consulting engineer, is vice-president in charge of the technical phases of gathering and presenting the exhibits.

It is expected that three floors of the Grand Central Palace will be occupied by the exhibits of the various states and already action has been taken in several through local chambers of commerce and through appropriate legislation to insure the success of the venture. The exposition is conducted with the single purpose of presenting to the people of the North and West an accurate picture of the South as a land rich in varied natural resources, offering splendid opportunity for the expansion of many industries.

Chemical Imports Into Canada Declined in Fiscal Year

The value of imports of inorganic chemicals into Canada decreased during the fiscal year ended March 31, 1924. The imports in the fiscal year 1921-22 amounted to $5,356,610, those of 1922-23 reached $6,107,231, and 1923-24 receipts totaled $5,699,956. The United States continued to be Canada's chief source of imports, being credited with 80 per cent in 1923-24, compared with 82 per cent in 1922-23 and 85 per cent in 1921-22.

Imports of soda ash from the United States showed a phenomenal decrease during the year ended March 31, 1924, having declined to 1,785 tons from 4,083 in the previous year. The importations of British soda ash, however, increased from 171 tons during 1922-23 to 455 for 1923-24, and that of caustic soda also advanced; imports of this product from Great Britain amounting to 897 tons during the last fiscal year compared with 124 tons in the previous year. Receipts of caustic soda from the United States dropped from 5,623 tons during 1923 to 4,486 in 1924, although the United States furnished, during the last year, 3,150 tons of caustic soda in solution, whereas shipments of this product amounted to only 1.5 tons during the two previous years. Canadian imports from the United States of sodium silicate, sal soda, phosphorus, magnesia, nitrate of soda, peroxide of soda, bichromate of soda, bisulphate of soda, saltpeter, calcium chloride, chlorine and alum cake showed increases during 1924 over the 1923 period. The importation of calcium chloride from the United States increased 67 per cent. The United States supplies the entire Canadian import requirement for liquid chlorine. Shipments of this commodity during 1923-24 amounted to $298,075, compared with $239,576 during the previous year.

Hart to Be Honored

Prof. Edward Hart is to be honored by a 3-day celebration Oct. 16 to 18, in recognition of his 50 years of continuous service in the Department of Chemistry at Lafayette College. In connection with this celebration an intersectional meeting has been planned by the Lehigh Valley Section, the New York Section, the Philadelphia Section, the South Jersey Section and the Wilmington Section of the American Chemical Society. To the college the celebration carries added interest in that it commemorates the hundredth anniversary of its founding.

The feature of the meeting from the scientific point of view is the symposium on plasticity planned for the second day, Friday, Oct. 17. On Thursday arrangements have been made for registration at the Gayley Chemical and Metallurgical Laboratory in the morning, following which Founder's Day exercises are to be conducted at Colton Memorial Chapel. In the afternoon a meeting is to be held at Pardee Auditorium, of which the general theme is to be "Fifty Years of Chemistry in America." At this time the speakers will include Dr. Edgar F. Smith, Dr. Harvey Wiley, Dr. William H. Nichols and Dr. Bradley Stoughton. Following this gathering a reception is planned at the home of Dr. and Mrs. Hart, and in the evening a banquet in honor or Dr. Hart is to be held at the Northampton Country Club, near Easton.

Trips have been planned for visitors on Saturday morning to points of interest in the Lehigh Valley, including the plants of Easton and Phillipsburg, Lehigh University and the Bethlehem Steel Co. and the laboratory and plant of the New Jersey Zinc Co. at Palmerton.

Washington News

Foreign Trade in Chemicals and Allied Products Declines

Although at first glance a study of the preliminary figures would seem to disclose a considerable loss in the United States foreign trade in chemicals and allied products in July, 1924, as compared with the preceding July, when such relative facts as the unusually high figures for the preceding July, the decline in values of many commodities and the general slowing up in business as a whole are taken into consideration, the foreign trade in chemicals was satisfactory.

July Exports 17 Per Cent Off

The total exports for the month of July, 1924, attained an aggregate value of $12,010,472, which was 17 per cent below those of July, 1923, which figure, however, as before stated, was exceptionly high and the peak month of that year. The imports of $10,999,925 in the current July were 28 per cent less than in July, 1923, when they had reached $15,208,394. It will be observed that the exports were more than $1,000,000 in excess of the imports.

Decreases or increases occurred in approximately the same classes in both imports and exports, although there were one or two rather sharp contrasts, such as medicinal and pharmaceutical preparations, imports of which more than doubled, while exports fell 0.8 per cent.

Probably the outstanding feature of the import trade was the marked reduction in the receipts of chinawood and linseed oils, and in coal-tar chemicals, to which accounts may be attributed in a large measure the drop in the imports as a whole. Imports of chinawood oil diminished from $1,754,558 (9,273,375 lb.) in July, 1923, to $453,921 (3,949,830 lb.) in July, 1924; linseed oil, from $1,098,622 (10,862,997 lb.) to $208,615 (2,818,583 lb.) and coal-tar chemicals from $1,381,063 to $881,474. The leading commodity of the last-named group was dead or creosote oil, imports of which amounted to 4,568,587 gal., valued at $512,537. Slightly more colors, dyes and stains were received in July, 1924 (238,968 lb., valued at $270,421) than during the preceding July.

Naval Stores Feature Export Trade

The $3,333,367 worth of naval stores, gums and resins exported in July, 1924, was a prominent feature of the export trade. This figure was the highest for any single month throughout the years 1922, 1923 and 1924 to date. During the month 144,372 bbl. of resin, valued at $1,329,000, and 2,153,788 gal. of spirits of turpentine, valued at $1,784,002, was shipped to foreign countries.

A pronounced increase was made in the shipments of sulphur, which rose from 32,228 tons, valued at $478,736, in July, 1923, to 43,606 tons, valued at $718,531, in July, 1923.

July, 1923, was conspicuous for the large amounts of coal-tar crudes, especially benzol, that were sent abroad, therefore it is not surprising that the exports for the total coal-tar group should have shown a loss this July as compared with last July. The leading commodity of this group, coal-tar colors, dyes and stains, which accounted for nearly two-thirds of the group, diminished from $778,168 (2,915,531 lb.) in July, 1923, to $555,615 (1,818,873 lb.) in July, 1924.

Each of the individual items included under the heading pigments, paints and varnishes showed a falling off in demand from foreign countries, the total exports for the month of July, 1924, having aggregated $1,061,118, which was 36 per cent less than the preceding July.

Both imports and exports of fertilizers and fertilizer materials in the current July were below those of the previous July. A decline in the values of the exports marked this trade, the total having been 98,503 tons, valued at $1,145,232, in July, 1924, as compared with 119,423 tons, valued at $2,550,860. Only half as much sulphate of ammonia was shipped this July as last.

In contrast to this loss, explosives advanced 89 per cent, from $108,563 ($687,314 lb.) to $205,588 (1,275,974 lb.), which was largely due to the gain in dynamite, figures for which in July, 1924, were $153,726 (1,063,450 lb.).

Stocks of Turpentine and Rosin Larger at End of Crop Year

The Bureau of Chemistry has completed its annual canvas of the stocks of turpentine and rosin held by and en route to factors, dealers and jobbers, but not consumers, at the primary ports and the important distributing points of the country at the close of business March 31, 1924, the last day of the preceding naval stores season. The corresponding data for the same date last year are given for comparison. The figures are shown in the following table:

	Turpentine, Casks		Rosin, Round Bbls.	
	Mar. 31, 1924	Mar. 31, 1923	Mar. 31, 1924	Mar. 31, 1923
Southern primary ports	29,982	21,040	307,543	278,414
Eastern ports	3,439	2,652	14,060	8,078
Cent. dist. points	14,232	10,881	28,881	46,938
Western points	8,246	2,225	1,492	1,340
	55,899	36,799	351,976	334,770

Increased Production of Lead Products in 1923

Plants engaged in the manufacture of lead products in 1923 had an output valued at $19,294,655. This is an increase of 84.2 per cent over 1921. The figures are those of the Bureau of the Census, which is now announcing the results of 1923 biennial census of manufactures. Lead pipe to the extent of 85,141,690 lb. was produced, an increase of 57.3 per cent over 1921. The output of lead sheets amounted to 34,246,044 lb., an increase of 61 per cent. Traps, bends, bars, shot, fittings, wire, calking material, rings, castings, babbitt, solder and mixed metals aggregating a value of $4,964,467 also were produced.

Gold and silver leaf and foil valued at $3,561,856 were produced in the United States in 1923. This is an increase of 7 per cent over the output in 1921. Sixty-four establishments were engaged primarily in the production of these materials.

Sicilian Sulphur Industry More Active This Year

W. Roderick Dorsey, consul at Catania, in a report on the sulphur industry states that the following table shows the condition in the sulphur industry of Catania and Sicily for the first 4 months of the current calendar year and of 1923, in metric tons:

	Catania		Sicily	
	1923	1924	1923	1924
Worked	16,017	29,336	54,806	76,755
Shipped	44,314	50,326	101,612	127,962
Stocks	33,461	30,577	223,977	190,355

The stocks on hand at Catania at the end of April were 23,455 metric tons less than at the end of December, 1923, and stocks for all Sicily were 54,844 metric tons less, indicating that good progress is being made in liquidating accumulations that were on hand prior to the agreement with American sulphur producers.

Sulphur shipments from Catania have been less active during the quarter under review than in the previous quarter, but a little more active than in 1923. Principal consumers have been Italy, Greece, Central America, Mexico, Turkey, Germany, Portugal, England, Dutch East Indies, British India and Spain.

German "Uspulun" Proves to Be Simple Mixture

An analysis by the Chemical Warfare Service of the German "Uspulun" reveals its composition to be sodium carbonate and an organic mercuric salt, a compound not calculated to be effective against the boll weevil, webb worms and other insect pests. In so far as it is known no such claims have been made for it by its manufacturers, but it has been represented in this country as having marvelous properties as an insect poison. It is purported to be a seed disinfectant and probably has no application beyond such use.

Importers Appeal From Ruling in Nitrite of Soda Case

The Norwegian Nitrogen Products Co. has appealed from the decision of the Supreme Court of the District of Columbia in the case where the court decided that the Tariff Commission was not required to make available all information gathered during the commission's survey of production costs. The appeal also raises the issue of validity of the provisions of the tariff law under which the duty on nitrite of soda was advanced.

News in Brief

Atlantic Dyestuff Property at Auction—The property of the Atlantic Dyestuff Co., Newington, N. H., is to be disposed of at public auction on Sept. 15. This consists of finished goods, raw materials, stores, hardware and machinists' supplies, factored goods, shipping supplies, office furniture, sundry patents, auto trucks and coal.

Industrial Alcohol Plant Near Montreal—Work is now under way on the construction of a distillery plant in the town of Lasalle, a suburb of Montreal, the plant being erected by the Distillers' Corporation, Ltd. This corporation intends to engage in the manufacture of industrial alcohol and it is expected that the plant will be ready for the initial production within 3 months.

Maryland Artificial Silk Plant Finished—The American Cellulose & Chemical Manufacturing Co., Ltd., is putting finishing touches on its new plant at Amcelle, near Cumberland, Md., and expects to commence active production in practically all departments by the close of the month. The plant has been in course of construction for some months past and will be given over to the manufacture of artificial or fiber silk; it is said to represent an investment in excess of $5,000,000. The company will operate with an authorized capital of $25,000,000 and 220,000 shares of common stock, no par value. It is headed by Dr. Camille Dreyfus as president. A. J. Fitch is works manager.

Newark Tanneries Resuming Full Production—Leather tanneries at Newark, N. J., are beginning to advance operations to a close to normal basis, following a period of curtailment for about 8 months past. All of the leading plants of this character are increasing their working forces, with prospects for an active fall season. The demand is growing, it is stated, for all classes of high-grade leather, with automobile upholstery leathers taking a leading position in point of call; the General Leather Co. and several other large tanneries in the city are devoted almost exclusively to this character of output.

Brown Corporation Loses Pulp Mill—The pulp mill of the Brown Corporation, Temiscouata County, Quebec, and 20,000 cords of pulpwood were destroyed by fire Aug. 25. The damage is estimated at a quarter of a million dollars.

Dynamite Manufacture Shown by Film—In co-operation with the Bureau of Mines, Department of the Interior, Washington, D. C., E. I. du Pont de Nemours & Co., Wilmington, Del., are arranging for the production of a motion picture film illustrating the manufacture of dynamite in the different branches, and setting forth safe and approved methods of distribution and handling. The use of the material in agricultural work will be made a special feature of the film, including picric acid utility and kindred specialties. It is expected to have the picture completed during the fall, making it available for showing by the Bureau of Education, educational institutions, engineering societies and other organizations.

Vickers Interested in Canadian Fuel—The Alberta Government has received a request from the firm of Vickers, Ltd., London, England, for samples of high-volatile lignites and bituminous sands for test purposes. This company has expended considerable capital in perfecting systems for the manufacture of coal byproducts and has just completed a process for low-temperature distillation of coals and oil shales.

Kane, Pa., Glass Plant Picks Up—The Interstate Window Glass Co., Kane, Pa., has resumed operations at its local sheet glass plant, following a shut-down since the first of the year. It is expected to advance production to a full capacity basis at an early date. The plant will give employment to about 300 operatives.

Arsenical Concentrates for Dyes—A cargo of 1,000 tons of arsenical concentrates from the gold fields of Nova Scotia has been purchased by an English firm for the British Government and will be used in connection with a new English process in the manufacture of dyes.

Tanneries to Prevent Polluting of Streams With Waste

To bring about the elimination of the pollution of state waters by trade wastes, leading leather tanneries in Pennsylvania have agreed to raise a fund of $35,000, for the purpose of conducting research and a series of practical experiments to develop a method of treating the wastes from the plants. The agreement was made at a recent conference between members of the State Sanitary Water Board and representatives of tanning plants producing about three-fourths of the annual output of leather in Pennsylvania. The companies will pay an assessment based upon their annual production, the first payment, totaling about $10,000, being due on Sept. 1. A committee of engineers has been appointed to conduct the experimental work, consisting of W. L. Stevenson, chief engineer of the state department of health; D. W. Alsop, chief chemist, Elk Tanning Co., Ridgeway; H. B. Norton, chief engineer of the last-noted company; A. W. Hoppenstedt, chemical adviser for the Howard, West Hickory and Millville tanneries; T. F. Oberlander, chemical engineer, Elkland Leather Co., Elkland, Tioga County; T. J. Powers, engineer, J. K. Mosser Co., Williamsport, and D. H. Ulrich, engineer, Kistler Leather Co., Lock Haven.

Rensselaer Polytechnic Celebrates Centennial Oct. 3 and 4

To celebrate its centennial, Rensselaer Polytechnic Institute, the oldest college of science and engineering in any English-speaking country, has arranged a gathering of some of the most eminent engineers in the world at Troy, N. Y., Oct. 3 and 4. Official delegates will be in attendance from educational institutions, scientific organizations and engineering societies as well as from each alumni association and each class that has graduated since 1857. One of the features of the celebration will be a pageant held on the campus on the evenings of Oct. 3 and 4, when outstanding scenes in the history of science and engineering during the past 100 years will be portrayed.

On the opening day the ceremonies begin with an academic procession and a convocation that will be addressed by Herbert Hoover, Secretary of Commerce of the United States; Alfred E. Smith, Governor of New York State; Harry E. Clinton, Mayor of Troy; Frank Pierrepont Graves, president of the University of the State of New York; Sir Charles Langbridge Morgan, president of the Institute of Civil Engineers of Great Britain; Henri Abraham, president of the Society of Electrical Engineers of France; Luigi Luiggi, president of the Society of Civil Engineers of Italy; Roberto Gayol, Hon. president of the Society of Engineers of Mexico, and Arthur Surveyer, president of the Engineering Institute of Canada.

Following this convocation two tablets are to be unveiled, on the site of the old main building that was destroyed by fire in 1904 and in the Carnegie Building in memory of S. Wells Williams, class of 1832. Addresses will be delivered at the first unveiling by Seymour van Santvoord, of Troy, and Mrs. James Carrol Frazer, a lineal descendant of Stephen Van Rensselaer, founder of the Institute. In honor of Williams, first professor of Chinese at Yale, an address will be delivered by Dr. S. K. Alfred Sze, Chinese Minister to the United States. In the evening prior to the pageant a dinner is to be held in the State Armory, when President Livingston Farrand of Cornell University and Director Joseph H. Odell, of the Service Citizens League of Delaware, will speak.

At the convocation to be held on the morning of Oct. 4 the following speakers will be heard: President Angell, of Yale University; President Birge, of the University of Wisconsin; President Stratton, of the Massachusetts Institute of Technology; President Grunsky, of the American Society of Civil Engineers; President Low, of the American Society of Mechanical Engineers; President Kelly, of the American Institute of Mining and Metallurgical Engineers; President Osgood, of the American Institute of Electrical Engineers and President Michelson, of the National Academy of Sciences. These addresses will be followed in the afternoon by a reception by President and Mrs. Ricketts and an alumni meeting. In the evening an alumni smoker is to be held.

Trade Notes

The Federal Trade Commission has dismissed its complaint against the Friedrich-Friedrich Chemical Co. of Philadelphia. The company is a manufacturer of toilet preparations, facial and massage creams, soaps and other products, and in the commission's complaint was charged with misrepresentation in advertising its products.

The first fall meeting of the Chemical Club of Philadelphia will be held at the Adelphia Hotel on Sept. 9.

H. H. Henderson has resigned as vice-president and director of F. R. Henderson & Co., of New York City, and has established a rubber brokerage business under his own name.

The Barclay Chemical Corporation, of New York City, has been appointed sole selling agent in the United States for John Tofft & Co., of Hamburg, manufacturers of fine and industrial chemicals.

Ira A. Wolf, a member of the Republic Metals Co., with offices in New York, was killed in an automobile accident on Aug. 29. Mr. Wolf was on the way to Purling, N. Y., to spend the week-end with his family, but in a collision with another automobile near Kingston, Mr. Wolf was injured and died shortly after the accident.

A report from Assistant Trade Commissioner D. S. Green at Paris says that a decree made effective by publication in the *Journal Officiel* of July 12 extends until Sept. 30, 1925, the requirement that all importers of petroleum fuels into France purchase from the government an amount of industrial alcohol equal to 10 per cent of their imports during the previous month.

David E. Breinig has resigned from Breinig Brothers, Inc., paint and varnish makers, at Hoboken, N. J.

Thirteenth Safety Congress to Be Held in Louisville, Ky.

On Monday, Sept. 29, the Thirteenth Annual Safety Congress, held under the auspices of the National Safety Council, is to open at the Brown Hotel, Louisville, Ky. The meeting is to continue through the week, ending on Oct. 3. Many papers are to be presented that bear upon safety work in the chemical engineering industries such as rubber, paper and pulp, petroleum, cement, packing and tanning, etc. Twenty-three sections have arranged programs of four or more papers. Every afternoon a special group of motion pictures on safety are to be shown and throughout the week there is to be held an exhibit of safety devices and appliances.

Among other addresses to be delivered at the general sessions are those by Richard F. Grant, on "Co-operation in Safety Among Trade and Other Organizations," and by James J. Davis, Secretary of Labor, on "Fundamentals of Our Safety Problem." At the annual banquet on Thursday evening, Herbert Hoover, Secretary of Commerce, will speak and Dr. Augustus Dyer, Vanderbilt University, will discuss "The Responsibility of Leadership."

At a joint meeting of the chemical section with the rubber section on Tuesday morning, Prof. C. E. Winslow, of Yale University, is to deliver the report of a special committee that has been investigating benzol poisoning. Following this a round-table discussion of lead poisoning is scheduled and a paper is to be read by George E. Tiley, of the General Chemical Co., on "Dangers Due to Malpractice in the Handling of Acid Tank Cars."

Three of the papers to be considered by the chemical section are: "Summary of Present Practice in Industrial Poisoning Prevention," by S. E. Whiting, Liberty Mutual Insurance Co.; "Corrosion and Its Relation to Safety in Chemical Plants," by J. H. Shapleigh, Hercules Powder Co., and "Demonstration of Safety Devices for Use in the Chemical Industry," A. L. Watson, Hooker Electrochemical Co.

Taking a few papers at random in the remaining sectional programs there may be mentioned "Reducing Accidents Caused by Machinery and Chemical Burns (in tanning plants)," by Fred Schwarze, Pfister & Vogel Leather Co.; "Hazards of the Sulphate and Soda Pulp Processes," by Charles Ludwig, Mead Pulp & Paper Co.; "Fire Prevention in Oil Properties," by F. A. Epps, Tidewater Oil Co.; "Proper Ventilation of Rubber Mixing Mills," by A. W. Crooks, C. J. Cox Engineering Co., and "Intangible Assets of the Cement Manufacturer," by W. G. H. Cam, Canada Cement Co.

England Increases Imports of Argentine Linseed

That England has been competing more keenly for linseed in Argentine markets is shown by the record of importations for the first 7 months of the year. Statistics show that India shipped nearly 40 per cent less than in the preceding year, with a corresponding gain in arrivals from the Argentine. Imports into England January-July inclusive offer the following comparisons:

Received from	1923 Tons	1924 Tons
Russia	1,001	975
Argentina	138,962	193,221
India	102,878	62,339
Other countries	14,651	11,600
	257,492	268,135

Paper Industry Heads to Meet Forest Research Body

To observe scientific methods of growing timber crops as developed during the past 15 years in the historic Harvard forest at Petersham, the Northeastern Forest Research Council and a committee of the pulp and paper industry will meet there on Sept. 4 and 5. The Research Council was appointed by Secretary of Agriculture Wallace last winter for the purpose of promoting forest research and of working out more reliable methods of growing timber in the forests of the Northeast. The council, which is composed of representatives of all interests concerned with forest research, is acting in an advisory capacity to the Northeastern Forest Experiment Station, forest schools, state forestry departments and other forest research agencies in the Northeast.

The pulp and paper representatives are members of an advisory committee appointed by Secretary Wallace to confer with him on forestry problems that concern the pulp and paper industry and the Department of Agriculture.

The meeting will be devoted primarily to studying the successful forestry operations carried out by Harvard University during about 15 years of intensive forest management. The conference will also discuss present and proposed forest research programs in the forests of the Northeast, the location of substations for the Northeastern Forest Experiment Station, and the Clarke-McNary forestry bill passed by the last session of Congress. The representatives of the pulp and paper industry are the following: George W. Sisson, chairman, Potsdam, N. Y.; Colonel W. E. Haskell, New York; Charles A. Gordon, New York; George W. Ostrander, Glens Falls, N. Y., and F. E. Bragg, Bangor, Me.

Financial

The U. S. Gypsum Co. has called a special meeting in Chicago Oct. 1 for submitting to stockholders an amendment recommended by the directors to increase the common stock from 400,000 shares, par value $20, to 500,000 shares, par value $20.

The Mathieson Alkali Works, Inc., has declared an extra dividend of 1¾ per cent on the preferred stock, thereby cleaning up the accumulation on this issue, and in addition has declared the regular quarterly 1¾ per cent preferred dividend.

The Hercules Powder Co., of Wilmington, Del., has declared regular quarterly dividend of 1½ per cent on the common stock.

Devoe & Raynolds Co., Inc., has declared an extra dividend of ½ of 1 per cent on common and the regular quarterly dividends of 1¼ per cent on common and 1¾ per cent on first and second preferred stocks.

The Texas Gulf Sulphur Co. has declared a quarterly dividend of $1.75. Previously the company had been paying $1.50 quarterly, and 3 months ago paid an extra of 25c. per share.

The Spanish River Pulp & Paper Mills, Ltd., of Canada, for the year ended June 30, reports gross income of $5,038,029, comparing with $4,008,155 in the preceding year. After depreciation, interest and taxes, net income was $3,119,660, against $2,183,417 in the previous year.

The Allied Chemical Co. has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company.

Men You Should Know About

A. M. BALLARD, general manager of the Sun Oil Co., Tulsa, Okla., is recuperating from a severe illness, which has confined him about 2 months.

EDWARD BREITWIESER has been at the Westport mill of the Dorr Co. since June 1 as an experimental and research chemist. The work involved problems in industrial waste disposal, paper mill white waters, clay refining and the many other applications of Dorr machinery.

MYRON J. BURKHARD, formerly in the engineering department of the Mazapil Copper Co., Ltd., in Mexico, is now in the engineering department of the Producers & Refiners Corporation, at Parco, Wyo.

HAROLD BURNS, of Carthage, N. Y., has been appointed assistant instructor in industrial and commercial chemistry, Clarkson School of Technology, Carthage.

MAURICE C. COCKSHOTT, heretofore maintenance engineer for the American Trona Corporation, Trona, Calif., has become connected with the West End Chemical Co., at Las Vegas, Nev.

C. WELDON CROWELL, formerly chemist of the Rochester Germicide Co., is now superintendent of the Pacific Chemical Co., with headquarters in Los Angeles, Calif.

JOSEPH C. DITTMER, chemical engineer, who resigned recently as chief chemist of the Republic plant, Vulcan Detinning Co., Pittsburgh, is now connected with the research laboratories of the National Lead Co., Brooklyn, New York.

LOUIS WHITNEY GRAVES, for many years a member of the firm of Samuel M. Green Co., consulting engineers, Springfield, Mass., and for the past 5 years sales manager with the J. P. Devine Co., Buffalo, N. Y., has resigned to accept the position of personal assistant to W. C. Carr, president and general manager of the Automatic Transportation Co., Buffalo, N. Y.

W. H. JOYCE has been elected president of the Sperry Flour Co., San Francisco, Calif., succeeding Seward B. McNear, resigned, following an association with the company for the past 14 years.

L. C. KARRICK, consulting engineer for the Bureau of Mines, is now permanently located in Salt Lake City, where he is engaged in consulting practice in connection with shale oil and coal distillation problems.

HENRY KIEL, chemist with the American Agricultural Chemical Co., Buffalo, N. Y., was seriously injured at the plant of that company on Aug. 26 in an explosion of a sulphur bin, which damaged the plant to the extent of $1,000.

CHARLES O. LAVETT, for many years associated with the Buffalo Foundry & Machine Co. as engineer in charge of tests and field erection, is now associated with the Chemical & Vacuum Machinery Co., Inc., as manager of that company.

FRIEND LEE MICKLE, special bacteriologist in food research at the New York Agricultural Experiment Station, Geneva, N. Y., announces his appointment, as of Sept. 1, as director of the Bureau of Laboratories of the Connecticut State Department of Health, Hartford, Conn.

E. G. RIPPEL, for many years associated with the Buffalo Foundry & Machine Co., having organized that company originally in 1901, has recently become connected with the Chemical & Vacuum Machinery Co., Inc., Buffalo, N. Y., as president of that company.

N. A. C. SMITH, senior petroleum chemist, United States Bureau of Mines, stationed at the Bartlesville, Okla., experiment division, is now at the office of the bureau at San Francisco, Calif., in connection with the study of motor lubricating oils now being conducted at that station.

HALE B. SOYSTER, recently appointed associate petroleum engineer, United States Bureau of Mines, will be located at the Bartlesville, Okla., experiment station of the bureau. He was formerly connected with the Superior Oil Co. of California.

EUGENE STAEGEMANN, formerly general manager of the Meadows Oil & Chemical Corporation, New York, has been appointed chief engineer for the Dayton Chemical Co., Lindsey Bldg., Dayton, Ohio, lately organized.

Prof. W. E. S. TURNER, D.Sc., M.Sc., secretary of the Society of Glass Technology, Sheffield, England, is now in the United States on a visit, accompanied by Mrs. Turner.

Calendar

AMERICAN CERAMIC SOCIETY, Los Angeles, Calif., Oct. 6 to 7.

AMERICAN CHEMICAL SOCIETY, sixty-eighth meeting, Cornell University, Ithaca, N. Y., Sept. 8 to 13.

AMERICAN ELECTROCHEMICAL SOCIETY, Detroit, Oct. 2 to 4.

AMERICAN FOUNDRYMEN'S ASSOCIATION, Milwaukee, Wis., Oct. 11 to 16, 1924.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pasadena, Calif., Oct. 13 to 17.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, Birmingham, Ala., Oct. 13 to 15.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, New York, Dec. 1 to 4.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, New York, Dec. 1 to 3.

AMERICAN SOCIETY FOR STEEL TREATING, Boston, Sept. 22 to 26.

FRANKLIN INSTITUTE CENTENNIAL, Philadelphia, Sept. 17 to 19.

MANAGEMENT WEEK. Auspices of American Society of Mechanical Engineers, New York City, Oct. 20 to 25.

NATIONAL SAFETY COUNCIL, Louisville, Ky., Sept. 20 to Oct. 3.

PACIFIC COAST GAS ASSOCIATION, Santa Barbara, Calif., Sept. 15 to 19.

TECHNICAL ASSOCIATION OF THE PULP & PAPER INDUSTRY, Hotel Statler, Buffalo, N. Y., Oct. 14 to 15.

WILLIAM H. WATTIS, general manager of the Utah-Idaho Sugar Co., Salt Lake City, Utah, is active in a campaign for the nomination for Governor of Utah.

Dr. GERALD L. WENDT has resigned his position at the Standard Oil Co., Whiting, Ind., to take the position of dean of the School of Chemistry and Physics at Pennsylvania State College.

Obituary

GEORGE WASHINGTON GARNAR, of Maplewood, N. J., a prominent leather manufacturer, died at his local residence, Aug. 24, aged 78 years. He was a member of the firm of John Campbell & Co., New York, leather manufacturers. He owned and operated a leather tannery at Monticello, N. Y., for about 40 years. He is survived by his wife, two sons and a daughter.

Dr. OLIVER WHIPPLE HUNTINGTON, of Plymouth, N. H., a noted metallurgist, died at his home, Aug. 22, aged 66 years. He was born at Marietta, Ohio, and was graduated from Harvard University, receiving the B.A. degree in 1881 and the Ph.D. degree in 1883. He was assistant and instructor at that institution from 1882 to 1894. Afterward he studied at schools in Europe for about a year, and upon his return founded in 1896 at Newport, R. I., the Cloyne House School, which was used by the Navy Department during the World War. He was a member of a number of scientific organizations.

GEORGE LAUDER, an associate of Andrew Carnegie, died at the home of his daughter, Mead's Point, Greenwich, Conn., Aug. 24, aged 87 years. He was connected with the Carnegie steel enterprises for about 30 years, being prominently identified with the Larimer Coke Co., Carnegie & Co. and Carnegie, Phipps & Co. He acted as superintendent for Carnegie & Co. and became a director of the Carnegie Steel Co., Ltd., upon its formation in 1892. He retired from active business in 1901. Mr. Lauder was a graduate of the University of Glasgow, 1856. He is survived by two daughters.

MARK W. MARSDEN, an inventor of chemical products, died Aug. 25 at his home in Logan, Pa., in his seventy-third year, following an illness of several months. He was the son of John Marsden, former Mayor of Leeds, England, and a noted chemist of England about a quarter of a century ago. Coming to this country at the age of 10, Mr. Marsden settled in Uniontown, Pa., where his father controlled an iron foundry. Before he was 20 years of age, Mr. Marsden managed the foundry.

ALEXANDER H. STECKER, gas engineer, died at Newark, N. J., Aug. 25. He had acted as construction engineer for the Public Service Gas Co. of the same city since its formation in 1909, and was part owner of the Mauch Chunk Gas Co., Mauch Chunk, Pa.

Market Conditions

Contract Withdrawals of Chemicals Indicate Enlarged Consumption

Larger Call Reported for Heavy Chemicals—Mineral Acids Share in Improved Trading Movement

CONSUMERS of chemicals have been ordering out material more regularly and deliveries from plants are reported to show a decided gain in volume as compared with the movement a month ago. Jobbing orders were prominent in the early part of the week but fell off later on and trading was quiet at the close of the period. Sellers, however, say the market is making progress and inquiry has been distributed among a larger number of selections. Improvement in sentiment is general and a satisfactory market is predicted for the last quarter of the year.

The weighted index number in the past two weeks has lost a good part of the advance which occurred in July and early August. The principal reason for the rise in the weighted number was found in steady advances in cottonseed oil and allied products. The decline in the weighted number has followed corresponding breaks in the oils and fats. Basic chemicals are holding a fairly steady course and fluctuations in minor chemicals have exerted very little influence on the index either toward higher or lower levels. The weighted number for the week was 156.87 as against 160.95 for the preceding week.

The metal markets have held a firm position and the derivatives reflect this condition. Most of the tin salts were advanced in price at the beginning of the month with radical upward revisions in tin crystals, bichloride of tin, and tin tetrachloride. Another instance is shown in the case of copper sulphate which is higher in price than it was a short time ago in spite of the fact that this is not an active buying period.

The extra-market features of nitrite of soda continue to keep that chemical in prominence. The latest development consisted in appeal from the recent decision of the Tariff Commission which refused to make public costs of domestic production and also because no ruling was given which would establish the validity of the flexible provision of the tariff act.

Acids

Both tartaric and citric acids have lapsed into seasonal quietness and the volume of new business reaching the market has hardly been large enough to hold prices on a steady level. Holders of tartaric have been eager to reduce stocks and open quotations of 26½c. per lb. have been heard. Imported citric has sold at 45½c. per lb. and according to reports is none too steady at that figure. Domestic makers continue to quote citric at 46c. per lb. for crystals and 47c. per lb. for powdered. Butyric acid has shown some strength and 60 per cent is held at an inside price of 55 per cent. Oxalic acid is a little firmer, as some sellers who had been willing to accept business at 9½c. per lb. were firm at 9¾c. per lb. Makers of boric acid are competing for business and market values are reported to be irregular. Improved call is reported for technical tannic acid with the market steady at 35c. per lb. Material improvement is noted in the movement of sulphuric acid and the reduction of surplus holdings has eliminated some of the low prices which featured the market a short time ago. This condition is true also in the case of the other mineral acids.

Export Prices for Caustic Potash Firmer — Higher Prices for Tin Crystals and Bichloride of Tin—Inquiry for Sal Ammoniac—Imported Caustic Potash Steady — Sulphuric Acid Moving More Freely—Prussiate of Potash Lower on Spot and for Shipment—Permanganate of Potash Lower—Formaldehyde Easier

Potashes

Bichromate of Potash—Consuming trades have been in a better position and buyers have been attracted by the lower prices which have ruled. Producers still are competing for business and quotations of 9c. per lb. as given in some quarters are largely nominal and 8¾@8¾c. per lb. is more nearly in line with the trading basis.

Caustic Potash—The firmer market which has ruled for the past two weeks has aroused buyers and numerous bids have been made at 6¾c. per lb. for spot material. However, there are no sellers at that price and while there were odd lots which could be picked up at 6¾c. per lb., the majority of sellers were asking 6¾c. per lb. Shipments from abroad were held on a parity with the spot prices.

Chlorate of Potash—Contract deliveries are taking care of the bulk of consuming needs and only scattered buying is reported in the spot market. Prices are holding a steady position with 6¾c. per lb. as the inside price of sellers.

Permanganate of Potash—Quiet call for prompt shipment together with lower prices for forward deliveries have given an easy tone to prices. Spot holdings were available at 13c. per lb. and this might be shaded. On shipments from abroad better than 13c. per lb. can be done.

Prussiate of Potash—Red prussiate is dull and prices are little better than nominal at 37c. per lb. Yellow prussiate has eased off in price in all positions. Holders of spot material have been willing to sell at 17c. per lb. and shipments from foreign markets have been available at 16½c. per lb.

Sodas

Bichromate of Soda—Sellers report a good outlook for the fall months and are finding a better outlet at present. The market has not yet regained a steady position, as reports are still heard that buyers of large lots can deal on private terms. Jobbing lots are more firmly held and have been less subject to competitive selling. Quotations for round lots are 6¾@7c. per lb. although some factors say they are not offering under the 7c. per lb. level.

Caustic Soda—Some producers who have been quoting low prices for export are said to be sold ahead for the present and where sales previously were made on a basis of 2.75@2.80c. per lb. f.a.s., the lowest price heard last week was 2.90c. per lb. and quotations ranged up to 3.05c. per lb. depending on make and seller. Only moderate inquiry was reported from foreign buyers. Domestic consumers are taking satisfactory amounts and the contract price has not been moved from the 3.10c. per lb. figure.

Nitrite of Soda—There has been no life to trading and consumers are said to be supplied for the present. Prices for spot goods are quoted at 8¾@9¼c. per lb. with the range depending on grade and seller. Chief interest in this material is confined to the controversy over import duties and import prices. Importers have filed a brief asking for a review of case which resulted in a higher duty and they also have raised an issue on the constitutionality of the flexible provisions of the tariff law. As previously reported, domestic producers have asked for an investigation on the ground that imported nitrite is being dumped in our markets.

Prussiate of Soda—Fair inquiry has continued and the lower price levels which have been reached have had a stimulating effect. Holders of imported prussiate were asking 9¼c. per

lb. for spot material but 9¼c. per lb. had been established as a trading basis and this was more in line with buyers' views. On shipments from abroad, 9¼c. per lb. was asked but it was stated that 9c. per lb. could be done.

Miscellaneous Chemicals

Arsenic—Imports of arsenic have decreased but considerable stocks are said to be left in sellers' hands and the present outlet is too restricted to admit of working off accumulations. Nominally the market for imported grades is unchanged at 7¼c. per lb. but the undertone is easy and undoubtedly firm bids under 7¼c. per lb. would uncover sellers. Domestic arsenic is steadily held at the 7¼c. level.

Barium Chloride—Consuming demand has continued quiet and offerings of imported have been pressed for sale. General asking prices for spot material are around $75 per ton but sales have been made at $73 per ton and this is regarded as an actual trading basis. Shipments are offered around $70 per ton and this might be shaded on firm bids.

Bleaching Powder—While producers are credited with carrying large stocks the market is free from pressure and buyers are forced to pay full quotation prices in order to secure supplies. The contract price is holding at $1.90 per 100 lb. in carlots, at works. No indication has been given regarding new contract prices and buyers are showing considerable interest in this phase of the market. Liquid chlorine also is in firm hands and former prices are being maintained.

Carbon Tetrachloride—While recent trading has cut down surplus holdings the market is still under pressure and buyers are favored. Sellers are in keen competition and the open quotations of 6¼@7c. per lb. are said to be none too steady.

Copper Sulphate—Spot holdings of imported sulphate have been reduced and some importers are quoting only for shipment. In some cases the imported material is offered at 4.40c. per lb. for both large and small crystals while other sellers offer small crystals at 4.60c. per lb. and ask up to 4.75c. per lb. for large crystals. Domestic sulphate is offered at 4¼c. to 4.75c. per lb. depending on seller and grade.

Formaldehyde—Inactivity of buyers has brought about an easier price tone. In most quarters there was a disposition to hold the market on a firm basis with 9c. per lb. as an inside price for carlots. Desire for business, however, influenced some holders to cut prices and there were offerings available under the 9c. level. This left the market in a position where private terms were possible and the undertone was easier than in the preceding week. Recent export buying has been quiet and in July, outward shipments were 47,432 lb. as compared with 94,320 lb. in July last year.

Sal Ammoniac—Imported white sal ammoniac has continued to meet with good inquiry. Interest has been shown in both spot goods and in shipments. Spot material is reported to have sold at 6c. per lb. and was quoted at that figure in some quarters. Sales also were reported at 6¼c. per lb. and prices evidently vary according to grade and seller. Shipments were generally quoted at 5¾c. per lb. but it is possible that 5¾c. per lb. could have been done.

Tin Salts—Effective at the beginning of the month a higher selling price was named for tin crystals. The revised quotation is 37c. per lb. Bichloride of tin also was marked up in price and September deliveries are selling on a basis of 14¾c. per lb. Anhydrous tetrachloride of tin was included in the upward movement and is now quoted at 30c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	156.87
Last week	160.95
Sept., 1923	172.00
Sept., 1922	148.00
Sept., 1921	147.00
Sept., 1920	267.00
Sept., 1919	272.00
Sept., 1918	278.00

A further sharp decline in crude cottonseed oil was responsible for a lowering of the weighted index number. Permanganate of potash, formaldehyde and animal fats aided in the decline.

Alcohol

Producers report a steady movement of denatured alcohol to consumers with a good inquiry for additional lots. There is a close harmony between production and consumption and with production costs holding up, the recent advance in price is easily maintained. Special denatured, formula No. 1 is quoted at 47c. per gal., in drums, for carload lots. Completely denatured, formula No. 5, is commanding 46c. per gal., in drums.

Methanol is reported to be developing a firmer tone, as producers are not overburdened with stocks and an improvement in buying would be quickly felt. Asking prices for methanol are repeated at 76c. per gal. for 97 per cent and 74c. per gal. for 95 per cent. In each case the quotation is on a basis, in bbl., carlots. Pure is offered at 75c. per gal. in tank cars, f.o.b. works.

Coal-Tar Products

Limited Supplies Hold Benzene in Firm Position—Naphthalene Offered at Concessions—Ortho-Toluidine Firmer

GRADUAL improvement in the buying movement, which has featured the market in recent weeks, was still in evidence and interest was said to have extended to a wider range of selections. The outlook is shadowed by some uncertainty about the effects of a lower import duty on dyes which will become effective in 2 weeks. In the meantime production of some of the important coal-tar products is proceeding on a limited scale and prices are on a steady to firm basis as a result of moderate offerings in sellers' possession. Fair export demand is heard, with foreign buyers showing interest in some products that are pretty well sold ahead.

Aniline Oil and Salt—Regular withdrawals against contracts are taking up the major part of production and better inquiry is developing for spot and prompt shipments. Quotations for the oil are maintained at 16c. per lb. in tanks at works. The salt is offered at 20@22c. per lb.

Benzene—With the movement from works large enough to leave very little surplus and resale material not a factor, first hands have shown a readiness to hold prices on a stable basis. Trading is necessarily confined to moderate-sized lots, with prices showing a range on a quantity basis. The quotation for the 90 per cent grade is kept at 23c. per gal. in tank cars and that for pure benzene at 25c. per gal.

Cresol—Consuming demand has been light for some time and producers have accumulations, which have given an unsteady tone to prices. In most cases the open asking price has been on a basis of 20c. per lb. for the U.S.P., but buyers have been favored where actual orders were in question and values have rested largely on private negotiations, with the 20c. per lb. quotation purely nominal.

Cresylic Acid—Sellers have been offering freely and have stimulated buyers' interest by showing a competitive tendency. Quotations have varied according to seller, with 95-97 per cent offered at 61c. per gal. and 97-99 per cent at 63c. per gal.

Naphthalene—Very little activity is reported for this material. Offerings of all grades are large and an easy undertone is noted. Flakes are offered at 4¼@4¾c. per lb. and balls at 5@5¼c. per lb. White chips are quoted at 4¼c. per lb. for round lots, with the usual differentials for smaller amounts. Crude is not attracting much attention from consumers and is held at 1.75@2c. per lb. depending on grade and seller.

Ortho-Toluidine—Stocks are in firm hands and values have shown a tendency to harden. Inquiry has been improving, and with stocks small, sellers are in a position of advantage. The inside price for round lots is given at 14c. per lb. and 16@17c. per lb. is asked for smaller amounts.

Phenol—This material has been featured by a difference in price according to seller, with 24c. per lb. the lowest price heard for prompt delivery. Demand is increasing and indications are generally regarded as favoring a higher selling level.

Pyridine—Spot material has been absorbed to a point where there is difficulty in securing large lots and the latter are purely nominal in price. Small lots are firmly held at $4.50 per gal. in drums. Foreign markets also are reported to be firm and shipments are quoted above $4 per gal.

Vegetable Oils and Fats

Selling Pressure Combined With Lower Priced Crude Oil Breaks Refined Cottonseed Oil Market—Linseed Oil Easier for Forward Deliveries

SELLING pressure, which was first inaugurated following the recent report on the cotton crop, gained headway last week and resulted in sharp declines in the option market for refined cottonseed oil. Lower price levels were aided by freer offerings of crude oil at concessions from previous levels and substantial evidence for a logical reduction in prices was furnished by reports that crude mills were able to buy seed at more attractive prices, thus insuring lower production costs for the oil. Future deliveries of linseed oil were lower and coconut oil sold more in buyers' favor. China wood and sesame oils were placed in a position of uncertainty, as conditions in China were expected to interfere with shipments.

Cottonseed Oil—Bearish influences were at work in this market and all deliveries moved sharply downward. Private estimates on the cotton crop have been under the recent official estimate but they were lost sight of in the general impression that prevailing prices were too high for the beginning of the crop year. Refiners had the incentive of securing crude oil at lower prices and crushers were agreeable to a reduced price for seed. This combination was effective in breaking the refined market, as the latter not only was without support but was further weakened by the presence of longs who became eager to liquidate when values began to fall. Sales of crude oil for immediate shipment were made at 9¼c. per lb. and September shipment closed nominally at 9c. per lb. Predictions of 8¾c. per lb. crude were freely made. Cash demand for refined oil eased off and it was apparent that consumers were cutting down transactions to pressing needs. Seed in the Southeast and in Texas was easier and reports were heard that $35 per ton had been reached as a trading basis.

Linseed Oil—Reports from the American and Canadian Northwest have been favorable for a good yield of flaxseed but reports of damage have come from the Argentine. Opinion favors a large world's supply of seed and crushers have been inclined to compete more actively for oil contracts covering forward deliveries. Limited stocks have a steadying influence on prompt shipment oil and $1.02 per gal. has been maintained as the open quotation for the first half of September. For the latter half of the month the price was reduced to 97c. per gal. October deliveries were offered at 93c. per gal. and November-April oil was freely quoted at 90c. per gal. Demand from the paint trade was only fair with buyers waiting for further developments before committing themselves far ahead. The linoleum trade was more prominent in the market and considerable business was reported to have been placed for delivery over the next few months. An arrival of foreign oil consigned to a crusher was noted during the week but foreign oil does not appear to be prominent.

China Wood Oil—Buyers were showing more interest in the latter part of the week but trading was quiet throughout the period. Spot oil was offered at 14½c. per lb. and goods afloat at 14¼c. per lb. Sellers' tanks for prompt shipment from the Pacific coast were held at 12¾@13c. per lb. Futures were more or less nominal as cables reported uncertainty about future movement from interior points and if internal conditions in China take a turn for the worse it was expected that prices for oil would be forced upward.

Corn Oil—Holders of crude oil were taking the initiative and prices as low as 10¼c. per lb. were named for immediate shipment in tank cars from mills in the Middle West. On later deliveries 10c. per lb. could be done and the weakness in cottonseed oil was said to have influenced sellers of corn oil.

Argentine Linseed Shipments Promise Record

As a result of the large production for the last crop year, shipments of linseed from the Argentine for the first 8 months of the year far exceed those for the corresponding period last year and if kept up over the remainder of the year promise a record for that country.

Shipments from Jan. 1 through August were as follows:

Shipped to	1924 Bushels	1923 Bushels
United Kingdom	5,696,000	2,548,000
Continent	17,830,000	11,580,000
United States	14,003,000	19,768,000
On orders	7,638,000	5,072,000
Totals	45,167,000	38,968,000

Coconut Oil—The market remained quiet with the price tendency toward lower levels. Futures from the Pacific coast were available at 8¾c. per lb. in sellers' tanks. Immediate shipment was firm with very little to be had. Ceylon type oil, prompt shipment from New York, was offered at 9⅜@9¾c. per lb., tank car basis, the price varying according to seller.

Olive Oil Foots—Arrivals from Mediterranean ports were reported and while some of this material was sold ahead, the spot supply was increased. Demand was quiet and prices unsteady as sellers were asking 9¾c. per lb. but 9⅝c. per lb. could be done on spot goods.

Rapeseed Oil—Buyers were not in evidence and the market was reported as dull. Spot oil was easy and reports were current that refined oil could be bought at 86c. per gal.

Sesame Oil—Spot oil sold at 14c. per lb. Arrivals from abroad were sold ahead and spot holdings are meager. Shipments were not quoted freely late in the week and primary markets are unsettled as a result of troubles in China.

Fish Oils—Further sales of menhaden in tanks were reported at 50c. per gal. f.o.b. shipping point. There were bids at 50c., however, which went unfilled. Fishing was reported as poor.

Tallow—The last sale of tallow was at 8¼c. per lb. Buyers were bidding 8⅛c. per lb. and the market closed unsteady. Yellow grease was offered at 7¼c. per lb. Oleo stearine declined sharply to 13¾@14c. per lb.

Miscellaneous Materials

Antimony—Toward the latter part of the week there was some uncertainty about shipments of Chinese grades and prices were largely nominal. Japanese was quoted at 10¼@10½c. per lb. Chinese needle, lump, was nominally quoted at 8½@9c. per lb. The oxide was firmer with 11½@12c. per lb. generally asked.

Barytes—Shipments during July and August were reported to have been about 70 per cent of normal. Inquiry is increasing and present business is described as good. Crude barytes is offered at $8 per ton f.o.b. producing points in Missouri. At Georgia mines 90@98 per cent is quoted at $9 per ton. White ground barytes has been offered at $17 per ton f.o.b. Baltimore and off color at $13 per ton. Water ground and floated, bleached, is held at $23@$24 per ton f.o.b. St. Louis.

China Clay—A freer movement is reported for all grades. Offerings are heard on a basis of $7 per ton f.o.b. Virginia mines for No. 1 crude; $8.50 per ton for washed; $13@$20 per ton for powdered. English clay is offered at $15@$20 per ton f.o.b. Atlantic ports for lump and $45@$50 per ton for powdered.

Fullers Earth—Seasonal demand is noted for this material. Florida producers quote 16 to 30 mesh at $16.50 per ton, 30 to 60 mesh at $18 per ton, 60 to 100 mesh at $14 per ton and plus 100 mesh at $7.50 per ton. Imported earth is held at $23@$25 per ton for powdered, duty paid.

Graphite—Consuming call has been more consistent with the various grades receiving attention. Ceylon lump is quoted at 5½@6c. per lb., chip at 4½@5c. per lb., and dust at 2@3½c. per lb. Crude amorphous graphite is offered at $15@$35 per ton, the powdered at 4@8c. per lb., and flake, finely ground, at 25@75c. per lb. Lubricating quality is 10@30c. per lb. and foundry quality ranges from 4c. to 8c. per lb.

Magnesite—Prices for this material depend on grade. At California producing points current quotations are: $35 per ton for 85 per cent, calcined lump; $45 per ton for calcined ground, 200 mesh. Dead burned is offered at $32@$34 per ton f.o.b. Washington points and at $40@$42 per ton f.o.b. Pennsylvania mines. Grecian caustic calcined is quoted at $50@$51 per ton c.i.f. New York.

White Lead—Producers say they are carrying numerous orders and find a good part of their production sold over the balance of the year. Pig lead has undergone no further changes and quotations for the pigments are repeated at 10c. per lb. for dry basic carbonate and 9½c. per lb. for basic sulphate.

Imports at the Port of New York

August 29 to September 4

ACIDS—Coal-tar—12 bbl., Hull, Merck & Co. **Cresylic**—6 dr., Liverpool, De Mattia Chemicals, Inc. **Tartaric**—80 kg., Rotterdam, W. Benkert & Co.; 820 csk., Palermo, Order.

ALBUMEN — 10 bbl. blood, Trieste, Farmers Loan & Trust Co.; 29 cs., Shanghai, Dodwell & Co.; 60 cs., Shanghai, MacAndrews & Forbes; 34 boxes, Shanghai, MacAndrews & Forbes.

AMMONIUM CARBONATE — 20 csk., Liverpool, Order.

AMMONIUM NITRATE—199 csk., Hamburg, Kuttroff, Pickhardt & Co.

ANTHRACENE OIL — 50 dr., London, Order.

ARSENIC — 91 bbl., Havana, American Metal Co.

BARIUM CARBONATE—500 bg., Hull, R. W. Greeff & Co.; 1,000 bg., Rotterdam, Roessler & Hasslacher Chemical Co.; 250 bg., Hamburg, Brown Bros. & Co.

BARIUM CHLORIDE — 53 cs., Antwerp, Order.

BARYTES—1 lot (in bulk), Hull, Order; 17 cs., Rotterdam, H. Kastor.

CALCIUM CHLORIDE—153 dr., Hamburg, C. Hardy, Inc.

CASEIN—1,693 bg., Buenos Aires, National City Bank; 70 bg., Bordeaux, Karolith Corp.; 324 bg., Havre, National City Bank; 1,000 bg., Buenos Aires, Order.

CHALK—675 bg., Bristol, H. J. Baker & Bro.; 550 bg. ground, Antwerp, Order; 700 bg., Southampton, National City Bank; 48 bg., London, Brown Bros. & Co.; 1 lot in bulk, Dunkirk, Taintor Trading Co.

CHEMICALS — 10 cs., Hamburg, P. Uhlich & Co.; 12 bbl., Bremen, Order; 13 bbl., Bremerhaven, Stanley-Doggett, Inc.; 280 bg., Glasgow, Coal & Iron National Bank; 3 cs., Hamburg, Agfa Products, Inc.; 1,000 cs., Rotterdam, Roessler & Hasslacher Chemical Co.; 45 csk., Rotterdam, H. A. Metz & Co.; 250 bg., Rotterdam, P. Uhlich & Co.; 25 cs., Rotterdam, Order; 600 bg., Bremen, Lehn & Fink.

CHINA CLAY—228 bg., Bristol, Order.

COAL-TAR DISTILLATE — 200 bbl., Hull, Merck & Co.

COLORS—2 csk. aniline, Genoa, Ackerman Color Co.; 25 csk. earth, Bremen, A. Northridge; 30 csk. Berlin blue, Rotterdam, Fesandie & Sperle; 20 csk. alizarin, Rotterdam, Kuttroff, Pickhardt & Co.; 1 cs. aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 10 csk. coal tar, Rotterdam, H. A. Metz & Co.; 4 csk. alizarin, Rotterdam, H. A. Metz & Co.; 40 csk. aniline, Rotterdam, Grasselli Dyestuffs Corp.; 3 csk. alizarin, Rotterdam, Grasselli Dyestuffs Corp.; 4 cs. bronze, Bremen, Order; 3 csk. aniline, Genoa, Order; 5 cs. aniline, Genoa, Order; 25 cs. aniline, Havre, Wetterwald & Pfister.

COPPERAS—52 bbl., Hamburg, Farmers Loan & Trust Co.

FERRO-SILICON—70 csk. Genoa, United States Steel Products Co.

FULLERS EARTH—550 bg., Bristol, L. A. Salomon & Bros.

GAMBIER — 240 cs. block, Singapore, Order.

GUMS—15 bg. copal, Antwerp, Bank of London & South America; 447 bg. copal, Antwerp, Order; 50 bg. arabic, Port Sudan, Anglo-Egyptian Bank; 500 bg. arabic, Port Sudan, Order; 69 bg., Antwerp, Chemical National Bank; 20 bg., London, Chemical National Bank; 31 cs. tragacanth, London, Thurston & Bradich; 100 cs. damar, Singapore, L. C. Gillespie & Co.; 79 bg. copal, Singapore, Guaranty Trust Co.; 100 cs. copal, Singapore, Guaranty Trust Co.; 50 cs. damar, Singapore, Guaranty Trust Co.; 140 bg. damar, Singapore, American Exchange National Bank; 387 bg. damar, Singapore, Baring Bros. & Co.

INDIGO—7 cs., London, Brown Bros. & Co.

IRON OXIDE—160 bg., Bristol, G. Z. Collins & Co.; 52 csk., Hull, J. Lee Smith & Co.; 44 csk., Liverpool, Reichard-Coulston; 10 csk., Liverpool, L. H. Butcher & Co.

LITHOPONE—150 csk., Antwerp, Benjamin Moore & Co.; 20 csk., Antwerp, A. Klipstein & Co.

MAGNESIA — 20 cs. carbonate, Liverpool, E. & J. Burke.

MAGNESITE — 50 csk. calcined, Hull, Order; 313 bg., Rotterdam, Speiden, Whitfield; 10 bg., Trieste, Order.

NAPHTHALENE—4 cs. London, P. McMichael.

OILS—Cod—200 csk., St. Johns, R. Badcock & Co.; 90 csk., St. Johns, Swan & Finch Corp. **Haarlem**—25 cs., Rotterdam, Lehn & Fink; 2 dr., Rotterdam, H. R. Lathrop & Co. **Linseed**—10 dr., Hull, Am-Hawaiian S. S. Co.; 194 bg. oxidized, Hull, Nairn Linoleum Co.; 1 lot in bulk, Hull, Order; 50 bbl., Hull, Order; 800 tons in bulk, Hull, Order; 1,322,772 lb., Rotterdam, American Linseed Co. **Neatsfoot**—50 tcs., Buenos Aires, Wilson & Co. **Olive foots (sulphur oil)**—200 bbl., Genoa, Heidelbach, Ickelheimer & Co.; 300 bbl., Leghorn, Leghorn Trading Co.; 200 bbl., Leghorn, Order; 100 bbl., Palermo, Order; 1,180 bbl., Lisbon, Heidelbach, Ickelheimmer & Co. Palm kernel—300 bbl., Hull, Order; 90 bbl., Liverpool, Order. **Palm**—154 csk., Hamburg, African & Eastern Trading Co.; 120 pkg., Rotterdam, Rayner & Stonington; 84 csk., Liverpool, Niger Co.; 100 bbl., Liverpool, Order. **Rapeseed**—950 bbl., Hull, Order; 225 bbl., Hull, Balfour, Williamson & Co.; 725 bbl., Hull, J. C. Francesconi & Co. **Seal**—125 csk., St. Johns, Bowring & Co. **Sunflower**—200 bbl., Copenhagen, Order; 100 dr., Copenhagen, Order. **Soya Bean**—1 lot (tank) in bulk, Hull Order; 150 bbl., Copenhagen, Order. **Sesame**—100 bbl., Hull, Order; 200 bbl., Antwerp, Order; 160 bbl., Rotterdam, Rayner & Stonington; 300 bbl., Rotterdam, Southern Cotton Oil Co.; 40 bbl., Rotterdam, Welch, Holme & Clark; 300 tcs., Rotterdam, Order; 300 bbl., Rotterdam, Order. **Tar**—3 bbl., Hamburg, Universal Oil Products Co.

OIL SEEDS—Copra—413 bg. Morant Bay, National Park Bank. **Castorseed**—1,689 bg., Calcutta, Anglo-South American Bank; 157 bg., Port de Paix, Huttlinger & Struller; 71 bg., Port de Paix, J. L. Hachtmann & Co.; 24 bg., Port de Paix, W. & A. Leaman. **Linseed**—17,262 bg., Buenos Aires, Spencer Kellogg & Sons; 86,857 bg., Rosario, Spencer Kellogg & Sons; 8,185 bg., Buenos Aires, Order. **Rapeseed**—165 bg., Rotterdam, A. G. Dunn; 50 bg., Rotterdam, F. T. Horton Co.; 50 bg., Rotterdam, Archibald & Lewis.

PHOSPHORUS—200 cs., Antwerp, W. E. Miller.

POTASSIUM SALTS — 100 bbl. alum, Hamburg, Superfos Co.; 2,000 bg. sulphate, 250 bg. muriate, 50 csk. chlorate and a quantity of manure salts, Antwerp, Societe Comm. des Potasses d'Alsace; 1,800 csk. chlorate, Hamburg, Seaboard National Bank; 300 bg. muriate, Hamburg, Potash Importing Corp.; 40 csk. carbonate, Hamburg, Parsons & Petit.

PYRITES—7,141,660 kilo, Huelva, The Pyrites Co.

QUEBRACHO — 23,334 bg. extract, Buenos Aires, Tannin Corp.; 20,485 bg. extract, Buenos Aires, International Products Co.; 2 bg. extract, Buenos Aires, Order.

QUICKSILVER—150 flasks, London, Order; 50 flasks, Genoa, A. H. Pickering.

ROCHELLE SALTS—20 csk., Hamburg, A. Marcus, Inc.

SAL AMMONIAC—150 csk., Bristol, C. de P. Field Co.

SHELLAC—133 bg. garnet lac, Calcutta, Brown Bros. & Co.; 113 bg. shellac, Calcutta, Brown Bros. & Co.; 267 bg. garnet lac, Calcutta, Lee, Higginson & Co.; 8 bg. shellac, Calcutta, Marx & Rawolle; 75 bg. seed lac, Calcutta, Marx & Rawolle; 25 bg. lac refuse, Calcutta, Marx & Rawolle; 896 bg. shellac, Calcutta, Order; 378 bg. seed lac, Calcutta, Order; 200 bg., Calcutta, Mac Lac Co.; 100 bg., Calcutta, Marx & Rawolle; 1,150 bbl., Calcutta, Order; 125 bbl. seed lac, Calcutta, Order; 11 bg., London, Order; 50 cs., London, Order.

SODIUM SALTS—42 dr. sulphite, Bristol, R. F. Downing & Co.; 200 csk. chlorate, Hamburg, Seaboard National Bank; 160 csk. hyposulphite, Rotterdam, Kuttroff, Pickhardt & Co.; 50 kg. hydrosulphite, Liverpool, W. Mohrmann; 7 csk. prussiate, Rotterdam, Meteor Products Co.; 12 kg. salicylate, London, Order; 52 cs. cyanide, Liverpool, Order; 7,070 sk. nitrate, Antofogasta, Antony Gibbs & Co.; 8,347 bg. nitrate, Iquique, Antony Gibbs & Co.

STRONTIUM NITRATE—316 csk., Rotterdam, Meteor Products Co.

TALC—250 bg., Genoa, L. A. Salomon & Bros.; 500 bg., Genoa, Italian Discount & Trust Co.; 350 bg., Bordeaux, L. A. Salomon & Bros.; 25 cs. cut, Bordeaux, Whittaker, Clark & Daniels; 1,400 bg., Bordeaux, L. A. Salomon & Bro.; 500 bg., Bordeaux, C. B. Chrystal; 90 cs., Bordeaux, Markwell Mfg. Co.; 1,000 bg., Bordeaux, Hammill & Gillespie; 550 bg., Bordeaux, Whittaker Clark & Daniels; 25 cs., Bordeaux, Whittaker, Clark & Daniels; 50 cs., Bordeaux, Order.

TARTAR—165 bg Genoa, Royal Baking Powder Co.; 188 bg., Bordeaux, American Express Co.

UMBER—14 csk. Manchester, Reichard-Coulston; 10 csk., Manchester, L. H. Butcher & Co.; 9 csk., Liverpool, L. H. Butcher & Co.

VARNISH—23 cs. oil, London, Pomeroy & Fischer.

WAXES—200 bg. mineral, Hamburg, L. S. Tainter; 111 bg. carnauba, Ceara, N. Y. Trust Co.; 160 bg. carnauba, Ceara, 10 bbl. beeswax, Rotterdam, Order; 400 bg. paraffin, London Order; 3 csk. beeswax, Santos, Order; 10 bbl. beeswax, Rio de Janeiro, Order; 81 bg. beeswax, Rio de Janeiro, Order.

WOODFLOUR — 830 bg., Rotterdam, Castle & Overton.

WOOL GREASE—10 bbl., Hull, J. D. Irwin & Co.; 35 bbl., Bremen, Order; 50 csk., Bremen, National City Bank; 90 bg. carnauba, Ceara, Lazard Freres; 390 bg. carnauba, Ceara, Order; 113 bg. carnauba, Pernambuco, Order; 10 bbl., Bremerhaven, Order.

ZINC CHLORIDE—87 csk., Antwerp, A. Klipstein & Co.

ZINC WHITE — 25 cs., Rotterdam, Roessler & Hasslacher Chemical Co.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ACID SULPHURIC. Recife, Brazil. Purchase.—11,420.

AMORPHOUS PHOSPHORUS, and sesquisulfide of phosphorus. Antwerp, Belgium. Agency.—11,414.

CHEMICALS for electroplating baths, etc. Melbourne, Australia. Agency.—11,443.

COPPER SULPHATE. Berlin, Germany. Agency.—11,417.

FERTILIZERS. Kalamata, Greece. Purchase.—11,495.

MANGANESE PEROXIDE. Berlin, Germany. Purchase.—11,418.

PAINTS AND COMPOSITIONS, roofing. Johannesburg, South Africa. Agency.—11,458.

POTASH, nitrate of, and sulphur. Recife, Brazil. Purchase.—11,419.

ROSIN AND PITCH. Rio de Janeiro, Brazil. Agency.—11,457.

ROSIN AND TURPENTINE. Vienna, Austria. Purchase and agency.—11,416.

SODA, CAUSTIC. Recife, Brazil. Purchase.—11,420.

TURPENTINE. Rangoon, India. Purchase and agency.—11,494.

VARNISHES AND ENAMELS. Bahia, Brazil. Agency.—11,413.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums, wks.	lb.	$0.16 –	$0.16½
Acetic anhydride, 85%, dr.	lb.	.34 –	.36
Acid, acetic, 28%, bbl.	100 lb.	3.12 –	3.37
Acetic, 56%, bbl.	100 lb.	5.85 –	6.10
Acetic, 80%, bbl.	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 –	11.51
Boric, bbl.	lb.	.09 –	.09½
Citric, kegs	lb.	.45½ –	.47
Formic, 85%	lb.	.12½ –	.13
Gallic, tech.	lb.	.45½ –	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.12½ –	.13
22% tech., light, bbl.	lb.	.06 –	.06½
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½ –	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.09½ –	.09¾
Phosphoric, 50% carboys	lb.	.07 –	.08
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66° drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.26½ –	.28
Tartaric, domestic, bbl.	lb.	.29 –	.30
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, f.o.b. works	lb	.27 –	.30
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.83 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.81 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.53 –	...
No. 1, 190 proof, special, dr.	gal.	.47 –	...
No. 1, 188 proof, bbl.	gal.	.56 –	...
No. 1, 188 proof, dr.	gal.	.50 –	...
No. 5, 188 proof, bbl.	gal.	.52 –	...
No. 5, 188 proof, dr.	gal.	.46 –	...
Alum, ammonia, lump, bbl.	lb.	.03½ –	.04
Potash, lump, bbl.	lb.	.02½ –	.03½
Chrome, lump, potash, bbl.	lb.	.05½ –	.06
Aluminum sulphate, com., bags	100 lb.	1.35 –	1.40
Iron free bags	100 lb.	2.35 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½ –	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12½ –	.12¾
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	2.50 –	2.60
Antimony oxide, white, bbl.	lb.	.11 –	.12
Arsenic, white, powd., bbl.	lb.	.07½ –	.07¾
Arsenic, red, powd., kegs	lb.	.14½ –	.15½
Barium carbonate, bbl.	ton	59.00 –	60.00
Barium chloride, bbl.	ton	73.00 –	74.00
Barium dioxide, 88%, drums	lb.	.17½ –	.18
Barium nitrate, casks		.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.03½ –	.04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	....
Spot N. Y. drums	100 lb.	2.20 –	2.25
Borax, bbl.	lb.	.05 –	.05½
Bromine, cases	lb.	.34 –	.38
Calcium acetate, bags	100 lb.	3.00 –	3.05
Calcium arsenate, dr.	lb.	.08 –	.09
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07½
Camphor, Jap. cases	lb.	.68 –	.69
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.06½ –	.07
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04¾
Domestic, heavy, bbl.	lb.	.03½ –	.04
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, tanks, wks.	lb.	.04½ –	....
Contract, tanks, wks.	lb.	.04½ –	....
Cylinders, 100 lb., wks.	lb.	.05½ –	.07½
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	15.00 –	16.00
Copper carbonate, bbl.	lb.	.17 –	.17½
Copper cyanide, drums	lb.	.45 –	.46
Copper oxide, kegs	lb.	.16½ –	.17
Coppersulphate, dom., bbl.	100 lb.	4.60 –	4.75
Imp bbl.	100 lb.	4.37½ –	4.50
Cream of tartar bbl.	lb.	.20½ –	.21
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2 00
Epsom salt, imp., tech., bags	100 lb.	1.30 –	1.35
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd.	lb.	.13 –	.14
Et'yl acetate, 85%, drums	gal.	.92 –	.95
Ethyl acetate, 99%, dr.	gal.	$1.08 –	$1.10
Formaldehyde, 40%, bbl.	lb.	.09 –	.09½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.25 –	....
Fusel oil, ref., drums	gal.	3.00 –	3.50
Fusel oil, crude, drums	gal.	2.00 –	2.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.92
Glycerine, c.p., drums extra	lb.	.19 –	.19½
Glycerine, dynamite, drums	lb.	.18½ –	....
Glycerine, crude 80%, loose	lb.	.12½ –	....
Hexamethylene, drums	lb.	.65 –	.70
Lead:			
White, basic carbonate, dry, casks	lb.	.10 –	....
White, basic sulphate, casks	lb.	.09½ –	....
White, in oil, kegs	lb.	.11½ –	.11¾
Red, dry, casks	lb.	.11 –	....
Red, in oil, kegs	lb.	.13½ –	.13¾
Lead acetate, white crys., bbl.	lb.	.14½ –	....
Brown, broken, casks	lb.	.13½ –	....
Lead arsenate, powd., bbl.	lb.	.16 –	.18
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½ –	....
Lithopone, bags	lb.	.06½ –	.06¾
Magnesium carb., tech., bags	lb.	.08½ –	.08¾
Methanol, 95%, bbl.	gal.	.74 –	.76
Methanol, 97%, bbl.	gal.	.76 –	.78
Methanol, pure, tanks	gal.	.75 –	....
drums	gal.	.78 –	.80
bbl.	gal.	.83 –	.85
Methyl-acetone, t'ks.	gal.	.70 –	....
Nickel salt, double, bbl.	lb.	.09 –	.10½
Nickel salts, single, bbl.	lb.	.10 –	.11
Orange mineral, csk	lb.	.14 –	.14½
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Phosphorus, yellow, cases	lb.	.37½ –	.40
Potassium bichromate, casks	lb.	.08¼ –	.09
Potassium bromide, gran., bbl.	lb.	.25 –	.38
Potassium carbonate, 80-85%, calcined, casks	lb.	.05 –	.05½
Potassium chlorate, powd.	lb.	.06½ –	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08½ –	.08¾
Potassium hydroxide (caustic potash) drums	lb.	.06½ –	.06¾
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06 –	.07½
Potassium permanganate drums	lb.	.13½ –	.14
Potassium prussiate, red, casks	lb.	.37 –	.38
Potassium prussiate, yellow, casks	lb.	.17 –	.17½
Salammoniac, white, gran., casks, imported	lb.	.06 –	.06¼
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk) works	ton	17.00 –	18.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	2.90 –	3.05
Sodium acetate, works, bbl.	lb.	.04½ –	.05
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.06½ –	.07
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb	.04½ –	.04¾
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22
Sodium fluoride, bbl.	lb.	$0.08½ –	$0.09
Sodium hyposulphite, bbl.	lb.	.02½ –	.02¾
Sodium nitrite, casks	lb.	.08½ –	.09
Sodium peroxide, powd., cases	lb.	.23 –	.27
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.03¾
Sodium prussiate, yel. bbl.	lb.	.09½ –	.10
Sodium salicylic, drums	lb.	.38 –	.40
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.02½ –	.03½
Sodium sulphite, crys., bbl.	lb.	.02 –	.02½
Strontium nitrate, powd., bbl.	lb.	.09½ –	.10
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb.	.14½ –	....
Tin oxide, bbl.	lb.	.55 –	....
Tin crystals, bbl.	lb.	.37 –	....
Zinc carbonate, bags	lb.	.12 –	.14
Zinc chloride, gran, bbl.	lb.	.06 –	.07½
Zinc cyanide, drums	lb.	.36½ –	.37
Zinc dust, bbl	lb.	.08½ –	.08½
Zinc oxide, lead free, bag	lb.	.07½ –	....
5% lead sulphate, bags	lb.	.06½ –	....
10 to 35 % lead sulphate, bags	lb.	.06½ –	....
French, red seal, bags	lb.	.09½ –	....
French, green seal, bags	lb.	.10½ –	....
French, white seal, bbl.	lb.	.11½ –	....
Zinc sulphate, bbl.	100 lb.	3.00 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.65
Alpha-naphthol, ref., bbl.	lb.	.65 –	.75
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl.	lb.	.20 –	.22
Anthracene, 80%, drums	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.75 –	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
f.f.e. drums	lb.	1.60 –	....
tech, drums	lb.	68	.72
Benzene, pure, water-white, tanks, works	gal.	.25 –	....
Benzene, 90%, tanks, works	gal.	.23 –	....
Benzidine base, bbl.	lb.	.80 –	.82
Benzidine sulphate, bbl.	lb.	.70 –	.72
Benzoic acid, U.S.P., kegs	lb.	.75 –	.85
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref. carboys	lb.	.35 –	....
Benzyl chloride, tech., drums	lb.	.25 –	....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresol, U.S.P., drums	lb.	.23 –	.26
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.63 –	.65
95-97%, drums, works	gal.	.58 –	.60
Dichlorbenzene, drums	lb.	.07 –	.08
Diethylaniline, drums	lb.	.59 –	.62
Dimethylaniline, drums	lb.	.35 –	.36
Dinitrobenzene, bbl.	lb.	.15 –	.17
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
Diphenylamine, bbl.	lb.	.48 –	.50
H-acid, bbl.	lb.	.72 –	.75
Meta-phenylenediamine, bbl.	lb.	.95 –	1.00
Michlers ketone, bbl.	lb.	3.00 –	3.25
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	1.20 –	1.30½
Naphthalene, flake, bbl.	lb.	.04½ –	.05½
Naphthalene, balls, bbl.	lb.	.05½ –	.05
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62½
Nitrobenzene, drums	lb.	.09 –	.09
Nitro-naphthalene, bbl.	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½ –	.14
N-W acid, bbl.	lb.	1.00 –	1.05
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.12 –	.13
Ortho-nitrophenol, bbl.	lb.	.95 –	1.00
Ortho-nitrotoluene, drums	lb.	.11 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.15
Para-aminophenol, base, kegs	lb.	1.20 –	1.25
Para-aminophenol, HCl, kegs	lb.	1.30 –	1.40
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitraniline, bbl.	lb.	.68 –	.70
Para-nitrotoluene, bbl.	lb.	.50 –	.55
Para-phenylenediamine, bbl.	lb.	1.35 –	1.45
Para-toluidine, bbl	lb.	.75 –	.80
Phthalic anhydride, bbl.	lb.	.25 –	.30
Phenol, U.S.P., dr.	lb.	.24 –	.26
Picric acid, bbl.	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	4.25 –	4.50
Resorcinol, tech., kegs	lb.	1.30 –	1.40

Resorcinol, pure, kegs	lb.	$2.00 –	$2.25
R-salt, bbl.	lb.	.50 –	.55
Salicylic acid, tech., bbl.	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl.	lb.	.35 –	..
Solvent naphtha, water-white, tanks	gal.	.25 –	....
Crude, tanks	gal.	.22 –	....
Sulphanilic acid, crude, bbl.	lb.	.16 –	.18
Tolidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.55
Toluene, tank cars, works	gal.	.26 –	....
Toluene, drums, works	gal.	.30 –	....
Xylidine, druma	lb.	.40 –	.42
Xylene, 5 deg.-tanks	gal.	.38 –	.40
Xylene, com., tanks	gal.	.25 –	.27

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.90 –	$5.95
Rosin E-I, bbl. 280 lb.		6.10 –	6.20
Rosin K-N, bbl. 280 lb.		6.10 –	6.30
Rosin W.G.-W.W., bbl. 280 lb.		7.50 –	7.90
Wood rosin, bbl. 280 lb.		5.40 –	5.50
Turpentine, spirits of, bbl.	gal.	.91 –	.....
Wood, steam dist., bbl.	gal.	.75 –	.....
Wood, dest. dist., bbl.	gal.	.56 –	.....
Pine tar pitch, bbl. 200 lb.		5.50 –	.....
Tar, kiln burned, bbl. 500 lb.		10.50 –	.....
Retort tar, bbl. 500 lb.		10.50 –	.....
Rosin oil, first run, bbl.	gal.	.40 –	.....
Rosin oil, second run, bbl.	gal.	.42 –	.....
Rosin oil, third run, bbl.	gal.	.46 –	.....
Pine oil, steam dist.	gal.	.60 –	.....
Pine tar oil, com'l.	gal.	.30 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½–	$0.05½
Grease, yellow, loose	lb.	.07½–	.07½
Lard oil, Extra No. 1, bbl.	gal.	.84 –	.85
Lard compound, bbl.	lb.	.15½–	.16
Neatsfoot oil, 20 deg., bbl.	gal.	1.30 –	.....
No. 1, bbl.	gal.	.84 –	.86
Oleo Stearine	lb.	.13½–	.14
Oleo oil, No. 1, bbl.	lb.	.16½–	.....
Red oil, distilled, d.p. bbl.	lb.	.09½–	.09½
Saponified, bbl.	lb.	.09½–	.09½
Tallow, extra, loose works	lb.	.08½–	.....
Tallow oil, acidless, bbl.	gal.	.84 –	.86

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.16½–	.....
Castor oil, No. 1, bbl.	lb.	.17 –	.....
Chinawood oil, bbl.	lb.	.14½–	.15
Coconut oil, Ceylon, bbl.	lb.	.10½–	.....
Ceylon, tanks, N.Y.	lb.	.09½–	.09¾
Coconut oil, Cochin, bbl.	lb.	.10½–	.....
Corn oil, crude, bbl.	lb.	.13½–	.13½
Crude, tanks, (f.o.b. mill)	lb.	.10½–	.11
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½–	.09¾
Summer yellow, bbl.	lb.	.14 –	.14½
Winter yellow, bbl.	lb.	.15 –	.15½
Linseed oil, raw, car lots, bbl.	gal.	1.02 –	.....
Raw, tank cars (dom.)	gal.	.96 –	.....
Boiled, cars, bbl. (dom.)	gal.	1.04 –	.....
Olive oil, denatured, bbl.	gal.	1.18 –	1.22
Sulphur, (foots) bbl.	lb.	.09½–	.09¾
Palm, Lagos, casks	lb.	.08½–	.08½
Niger, casks	lb.	.08 –	.....
Palm kernel, bbl.	lb.	.10 –	.....
Peanut oil, crude, tanks (mill)	lb	.13 –	.....
Peanut oil, refined, bbl.	lb.	.17 –	.17½
Perilla, bbl	lb.	.14 –	.14½
Rapeseed oil, refined, bbl.	gal.	.86 –	.88
Sesame, bbl	lb.	.14 –	.14½
Soya bean (Manchurian), bbl.	lb.	.12 –	.12½
Tank, f.o.b. Pacific coast	lb.	.10½–	.10½
Tank, (f.o.b. N.Y.)	lb.	.10¼–	.....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.63 –	$0.65
Menhaden, light pressed, bbl.	gal.	.64 –	.....
White bleached, bbl.	gal.	.66 –	.....
Blown, bbl.	gal.	.68 –	.....
Crude, tanks (f.o.b. factory)	gal.	.50 –	.55
Whale No. 1 crude, tanks, coast	lb.	.....	.....
Winter, natural bbl.	gal.	.75 –	.76
Winter, bleached bbl.	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$33.00 –	34.00
Cottonseed meal, f.o.b. mills	ton	43.00 –	44.00
Linseed cake, bags	ton	44.00 –	.....
Linseed meal, bags, spot	ton	46.00 –	.....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.33 –	.35
Cutch, Borneo bales	lb.	.04½–	.04¾
Cutch, Rangoon, bales	lb.	.13½–	.14½
Dextrine, corn, bags 100	lb.	4.32 –	4.75
Dextrine gum, bags 100	lb.	4.82 –	5.09
Divi-divi, bags	ton	40.00 –	42.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier cum., bags	lb.	.13½–	.13¾
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½–	.03
Sumac, leaves, Sicily, bags	ton	125.00 –	130.00
Sumac, ground, bags	ton	123.00 –	.....
Sumac, domestic, bags	ton	50.00 –	55.00
Starch, corn, bags 100	lb.	3.87 –	4.08
Tapioca flour, bags	lb.	.04½–	.06

Extracts

Archil, conc., bbl.	lb.	$0.16 –	$0.19
Chestnut, 25% tannin, tanks	lb.	.01½–	.02½
Divi-divi, 25% tannin, bbl.	lb.	.05 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09½
Gambier, liq., 25% tannin, bbl.	lb.	.11 –	.11
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½–	.04
Hypernic, solid, drums	lb.	.22 –	.24
Hypernic, liquid, 51°, bbl.	lb.	.12 –	.13
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.07½–	.08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Osage Orange, powder, bg.	lb.	.14 –	.15
Quebracho, solid, 65% tannin, bbl.	lb.	.04½–	.04½
Sumac, dom., 51°, bbl.	lb.	.06½–	.06½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.09 –	$0.11
spot, cases	lb.	.12 –	.16
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.36 –	.38
Prussian, bbl.	lb.	.36 –	.38
Ultramarine, bbl.	lb.	.07 –	.35
Browns, Sienna, Ital., bbl.	lb.	.05 –	.12
Sienna, Domestic, bbl.	lb.	.03 –	.03½
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.10½–	.11½
Paris, bulk	lb.	.24 –	.26
Reds Carmine No. 40, tins	lb.	4.25 –	4.50
Iron oxide red, casks	lb.	.08 –	.12
Para toner, kegs	lb.	.95 –	1.00
Vermilion, English, bbl.	lb.	1.30 –	1.35
Yellow, Chrome, C.P. bbls.	lb.	.17 –	.17½
Ocher, French, casks	lb.	.02 –	.03

Waxes

Bayberry, bbl.	lb.	$0.21 –	$0.21½
Beeswax, crude, Afr. bg.	lb.	.25 –	.26
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candelilla, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.34 –	.36
No. 2, North Country, bags	lb.	.25 –	.26
No. 3, North Country, bags	lb.	.23 –	.23½
Japan, cases	lb.	.17½–	.18
Montan, crude, bags	lb.	.06 –	.06½
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.06½–	.06¾
Crude, scale 124-126 m.p. bags	lb.	.05½–	.06½
Ref., 118-120 m.p., bags	lb.	.06½–	.06½
Ref., 123-125 m.p., bags	lb.	.06½–	.06½
Ref. 128-130 m.p., bags	lb.	.06½–	.06½
Ref., 133-135 m.p., bags	lb.	.08 –	.08½
Ref., 135-137 m.p., bags	lb.	.09½–	.10
Stearic acid, agle pressed, bags	lb.	.11 –	.11½
Double pressed, bags	lb.	.11½–	.12
Triple pressed, bags	lb.	.12½–	.13

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works 100	lb.	2.70 –	.....
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	4.50 –	.....
Nitrate of soda, bags 100	lb.	2.50 –	.....
Tankage, high grade, f.o.b. Chicago	unit	2.50 –	.....
Phosphate rock, f.o.b. mines			
Florida pebble, 68-72%	ton	3.25 –	3.70
Tennessee, 75%	ton	6.75 –	7.00
Potassium muriate, 80%, bags	ton	34.55 –	.....
Potassium sulphate, bags basis 90%	ton	45.85 –	.....
Double manure salt	ton	26.35 –	.....
Kainit	ton	7.22 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.29½–	.....
Upriver coarse	lb.	.23 –	.....
Upriver caucho ball	lb.	.22 –	.....
Plantation—First latex crepe	lb.	.27½–	.....
Ribbed smoked sheets	lb.	.26½–	.....
Amber crepe No. 1	lb.	.27 –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.08 –	$0.10
East Indian, bold, bags	lb.	.13 –	.14
Manila, pale, bags	lb.	.18 –	.19
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.23½–	.24
Singapore, No. 1, cases	lb.	.27½–	.8
Singapore, No. 2, cases	lb.	.18½–	.19
Kauri, No. 1, cases	lb	.58 –	.64
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.06 –	.09

Shellac

Shellac, orange fine, bags	lb.	$0.63 –	$0.64
Orange superfine, bags	lb.	.65 –	.66
A. C. garnet, bags	lb.	.61 –	.62
Bleached, bonedry	lb.	.70 –	.71
Bleached, fresh	lb	.60 –	.61
T. N., bags	lb.	.60 –	.61

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec	sh ton	$300.00 –	$400.00
Asbestos, shingle, f.o.b. Quebec	sh. ton	50.00 –	60.00
Asbestos, cement, f.o.b., Quebec	sh ton	15.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	17.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	23.00 –	24.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	9.00
Casein, bbl., tech.	lb.	.11 –	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.50 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50 –	7.25
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 gr'd. N. C.	long ton	15.32 –	21.00
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 –	.....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½–	.06
Ceylon, chip, bbl.	lb.	.04½–	.05
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.11½–	.11¾
Gum tragacanth, sorts, bags	lb.	.50 –	.51
No. 1, bags	lb.	1.20 –	.....
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00 –	45.00
Pumice stone, imp., casks	lb.	.03 –	.40
Dom., lump, bbl.	lb.	.06 –	.08
Dom., ground, bbl.	lb.	.03 –	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.25
Silica, sand blast, f.o.b. Ind.	ton	2.25 –	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	.....
Silica, glass sand, f.o.b. Ill.	ton	2.00 –	2.50
Soapstone, coarse, f.o.b. Vt., bags	ton	7.50 –	8.00
Tale, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 –	.....
Talc, 200 mesh, f.o.b. Ga., bags	ton	9.50 –	10.00
Talc, 325 mesh, f.o.b. New York, grade A bags	ton	14.75 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 –	$3.00
Corning	bbl.	1.75 –	.....
Cabell	bbl.	1.45 –	.....
Somerset	bbl.	1.55 –	.....
Illinois	bbl.	1.62 –	.....
Indiana	bbl.	1.63 –	.....
Kansas and Okla. under 28 deg.	bbl.	.90 –	.....
California, 35 deg. and up	bbl.	1.40 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.18 –	.....
Naphtha, V. M. & P. deod, steel bbls	gal	.17 –	.....
Kerosene, ref tank wagon	gal.	.13 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.07½–	.07¾
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.29 –	.32
Bloomless, 30@31 grav.	gal.	.20 –	.21
Paraffin, pale 885 vis	gal.	.15½–	.16½
Spindle, 200, pale	gal.	.21 –	.21½
Petrolatum, amber, bbls.	lb.	.04 –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145	
Chrome brick, f.o.b. Eastern shipping points	ton	50–	
Chrome cement, 40-50% Cr_2O_3	ton	25–27	
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00	
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45	
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38	
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68	
9-in. arches, wedges and keys	ton	80–85	
Scraps and splits	ton	85	
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50	
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50	
F.o.b. Mt. Union, Pa.	1,000	38–39	
Silicon carbide refract. brick, 9-in.	1,000	1,180.00	

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	.....

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30 –
4-6% C	lb.	.12½–
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr.ton	92.50 – 95.00
Spiegeleisen, 19-21% Mn.	gr.ton	33.00 – 35.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 – 2.25
Ferrosilicon, 10-12%	gr.ton	39.50 – 43.50
50%	gr.ton	72.00 – 75.00
Ferrotungsten, 70-80% per lb. of W	lb.	.88 – .90
Ferro-uranium, 35-50%, o U, per lb. of U	lb.	4.50 –
Ferrovanadium, 30-40% per lb. of V	lb.	3.25 – 3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 – $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3,	ton	22.00 –
C.i.f. Atlantic seaboard	ton	18.50 – 24.00
Coke, fdry., f.o.b. ovens	ton	4.00 – 4.50
Coke, furnace, f.o.b. ovens	ton	3.00 – 3.25
Fluorspar, gravel, f.o.b. mines, Illinois	ton	22.00 – 23.50
Ilmenite, 52% TiO_2 Va	lb.	.01½–
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.42 – .46
Manganese ore, chemical (MnO_2)	ton	75.00 – 80.00
Molybdenite 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.70 –
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 – .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 –
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –
Rutile, 94@96% TiO_2	lb.	.12 – .15
Tungsten, scheelite, 60% WO_3 and over	unit	9.00 –
Tungsten, wolframite, white, 60% WO_3	unit	8.50 – 8.75
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 – 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 – 12.50
Vanadium pentoxide, 99%	lb.	12.50 – 14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 – 1.25
Zircon, 99%	lb.	.06 – .07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13½– $0.13¾
Aluminum, 98 to 99%	lb	.27 – .28
Antimony, wholesale, Chinese and Japanese	lb.	.10½– .10¾
Nickel, 99%	lb.	.27½– .29
Monel metal, shot and blocks	lb	.32
Tin, 5-ton lots, Straits	lb.	.51½
Lead, New York, spot	lb.	08
Lead, E. St. Louis, spot	lb.	08
Zinc, spot, New York	lb.	.0655
Zinc, spot, E. St. Louis	lb.	.0620
Silver (commercial)	oz.	.68½
Cadmium	lb.	.60
Bismuth (500 lb. lots)	lb.	1.85–1.90
Cobalt	lb.	2.50–3.00
Magnesium, ingots, 99%	lb.	.90–.95
Platinum, refined	oz.	120.00
Iridium	oz.	260.00–270.00
Palladium, refined	oz.	78.00–83.00
Mercury	75 lb.	72.00–
Tungsten powder	lb.	.95–1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20.62½
Copper bottoms	29.25
Copper rods	20.00
High brass rods	17.25
High brass rods	14.75
Low brass wire	19.50
Low brass rods	20.00
Brazed bronze tubing	24.75
Seamless copper tubing	22.75
Seamless high brass tubing	21.50

OLD METALS—The following are the dealers purchasing prices in cents per pound:

Copper, heavy and crucible	11.50 @ 11.75
Copper, heavy and wire	11.00 @ 11.25
Copper, light and bottoms	9.50 @
Lead, heavy	6.75 @ 6.80
Lead, tea	5.00 @ 5.25
Brass, heavy	6.50 @
Brass, light	5.50 @
No. 1 yellow brass turnings	7.00 @ 7.25
Zinc scrap	3.75 @ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.34	$3.34
Soft steel bars	3.24	3.24
Soft steel bar shapes	3.54	3.54
Soft steel bands	3.99	3.99
Plates, ¼ to 1 in. thick	3.34	3.34

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

TARRANT CITY—The Alabama By-Products Corp. has commenced work on addition to its local coke-oven and byproducts plant, designed to develop about one-third increase in present output. The coke department will have a rated capacity of 1,350 tons per day, with corresponding increase in benzol and other byproducts production. The expansion is estimated to cost close to $1,000,000 and is expected to be completed early next spring. Headquarters of the company are in the American Trust Bldg., Birmingham, Ala.; Morris Bush is president.

FLORENCE—The Florence Concrete Products Co., Commerce St., will soon begin the erection of a new 1-story plant, for the manufacture of concrete blocks and kindred cast products. J. L. Buffler is president.

TALLADEGA—The city commission will commence extensions and improvements at the municipal artificial gas plant to develop about 200,000 cu.ft. per day. The work will include the installation of new purifying apparatus, scrubbers and accessory equipment, estimated to cost approximately $80,000. A contract for certain equipment has been awarded to the Stacey Brothers Mfg. Co., Cincinnati, O., and other awards will soon be made.

RAGLAND—The National Cement Co. is planning for the immediate rebuilding of the portion of its local mill, destroyed by fire, Aug. 16, with loss estimated at close to $1,000,000, including buildings, equipment and stock. A new raw grinding department, machine shop, packing house and stock house are among the structures to be replaced.

Arkansas

BETHESDA—The Batesville White Lime Co. is said to be developing plans for early operations on local limestone properties, and will establish a new community to be known as Limedale. The initial work will include a number of buildings for quarrying and other service, with power house and industrial railway line. It is estimated to cost $200,000, including equipment.

California

LOS ANGELES—The Mefford Chemical Co., 749 San Pedro St., has plans under way for the erection of a new 3-story building at Sacramento St. and Santa Fe Ave., 50x140 ft., estimated to cost approximately $50,000. The Arthur E. Mortimer Co., Chapman Bldg., is architect.

LOS ANGELES—The Culver City Lime Co., Culver City, Los Angeles, has filed plans for the erection of a new 1-story plant at 6505 Featherstone Dr., Sawtelle Annex, to be 40x135 ft., for which foundations will be laid at once.

Florida

TAMPA—The Lyons Fertilizer Co., recently formed with a capital of $250,000, has work in progress on additions and improvements in a local commercial fertilizer works, including remodeling of present plant and the installation of considerable additional equipment for increased output. Charles W. Lyons is president.

BANANA LAKE—The Southern Phosphate Corp., 25 Broad St., New York, N. Y., is perfecting plans for the proposed development and operation of phosphate properties in the vicinity of Banana Lake. Considerable equipment will be installed, including mining machinery, conveying, hoisting and other apparatus. It is said that work will be commenced about the close of the year.

Georgia

LOUISVILLE—The Louisville Oil Mill, devoted to the production of cottonseed oil products, has been acquired by the Whigham & Bethea Co., which will take immediate possession. Plans are under way for extensions and betterments. It is purposed to place the mill in operation at an early date.

Illinois

CHICAGO—The Diamond Red Paint Co., 2750 North Lincoln Ave., has taken title to a tract of about 20 acres of land at Stewart Ave. and 142nd St., Riverdale, for a consideration stated at $40,000. At a later date, it is purposed to use a large portion of the land as a site for a new plant, to cost in excess of $100,000, with equipment.

CHICAGO—The American Envelope Co. has construction in progress on a new plant at 3070 Grand Ave., extending to 3031-39 Walton St., site for which was recently acquired, and plans for the early installation of equipment. It is estimated to cost approximately $125,000. L. E. Russell, Chicago, is architect.

Louisiana

NEW ORLEANS—The American Molasses Co., Godchaux Bldg., has preliminary plans under way for the construction of a new refinery, in connection with a storage and distributing plant, cooperage works, and other buildings, on site bounded by Clouet, Montegut, Levee and Chartres Sts. The entire project is said to involve in excess of $100,000, with equipment.

Massachusetts

HANOVER—The E. H. Clapp Rubber Co., operating a plant for reclaimed rubber production, and other rubber manufacture, has awarded a general contract to the Morton C. Tuttle Co., Boston, for the erection of a number of new buildings at the local works, to replace structures destroyed by fire several weeks ago, with loss approximating $80,000. Additional equipment will be installed. Alterations and improvements will also be made in present building.

BOSTON—The Tileston & Hollingsworth Co., 892 River St., manufacturer of paper products, has taken out a permit for the erection of the proposed addition to its plant, estimated to cost $50,000, for which work will be placed in progress at once.

NEWTON—The Stow & Woodward Rubber Co. has plans under way for the erection of a 1-story addition to its plant, 60x107 ft., estimated to cost about $18,000. Work will begin at an early date.

Michigan

FLINT—The A. C. Spark Plug Co., manufacturer of porcelain spark plugs, has construction in progress on a 3-story addition to its plant to be used for considerable increase in output, and purposes to have the structure ready for service at an early date.

Missouri

CUMBERLAND—The Union Tanning Co. is said to have plans under way for the reconstruction of the buildings at its plant recently destroyed by fire with loss of about $75,000, including equipment.

New Jersey

JERSEY CITY—The New York Blue Print Paper Co., 96 Reade St., New York, has awarded a general contract to C. W. Randall, 201 Lake St., West Hoboken, N. J., for the erection of an addition to its plant, 1- and 3-story, 100x135 ft., including alterations and improvements in the present works, estimated to cost $35,000, Terrace Ave., near Lincoln St. John Helmers, 135 Summit Ave., West Hoboken, is architect.

TRENTON—The Thomas Maddock's Sons Co., Perry St., manufacturer of sanitary ware, has disposed of a bond issue of $1,000,000, the proceeds to be used in connection with the erection of its new plant at Hutchinson's Mills, Hamilton Township, near Trenton, now in course of building. The pottery will consist of a main building, totaling 375,000 sq.ft. of floor area, with several smaller structures, including power house, machine shop, etc., and is expected to be ready for operation early in the coming year. A. M. Maddock is president.

NEWARK—The Hanovia Chemical & Mfg. Co., Chestnut St. and New Jersey Railroad Ave., has leased space in the building at 59 Hoyt St., for extensions, to be equipped primarily for the production of quartz

burners for violet ray purposes and kindred specialties.

CAMDEN—The Armstrong Cork Co., insulation department, Jefferson St., has tentative plans under advisement for the construction of a new addition to its plant. C. W. Russ is manager.

New Mexico

MAXWELL—The Midwest Sugar Co. has work in progress on extensions and improvements in its local refining plant, including the installation of additional equipment. The mill will be arranged for a heavy fall run.

New York

BUFFALO—The Plastergen Wall Board Co., 190 Philadelphia St., manufacturer of plaster board products, has taken out a permit to build a 1-story addition to its plant, 25x126 ft.

BUFFALO—William F. Schwartz, commissioner of public works, Municipal Building, is taking bids until Sept. 15 for superstructure work for a new chemical building at the municipal filtration plant, now in course of erection. The entire plant will cost close to $3,000,000, and will be ready for service during the coming year.

BUFFALO — The Pohlmann Foundry Co., Baltz St., manufacturer of light iron and steel castings, etc., has filed plans for the construction of a 1-story foundry addition at 227 Baltz St., for which foundations will be laid at once.

North Carolina

KINSTON — The Carolina Dunntile Co., West Washington St., M. L. Shealy, secretary and treasurer, recently organized, has commenced the erection of a new 1-story plant, 50x100 ft., to be equipped for the manufacture of concrete tile, culverts, and kindred products.

WILMINGTON — The Virginia - Carolina Chemical Co., now being operated under a receivership, has secured permission from the federal court to make extensions and betterments in the acid works and other departments, as well as power houses, at its Almont and Navassa plants, to cost $31,100. Similar work will be carried out also at three of the plants of the company in the state, at Selma, New Bern and Washington, respectively, to cost approximately $29,000.

Ohio

AKRON—The General Tire & Rubber Co., has broken ground for the construction of three additional plant units, to be each 3-story, equipped for general production. The expansion will cost approximately $300,000, with machinery.

CLEVELAND—The Petroquin Paper Co., 1250 West 3rd St., has awarded a general contract to the Craig Curtis Co., 4614 Prospect Ave., for the erection of a new 3-story and basement building at 1556-1604 Oregon Ave., estimated to cost $300,000, for which work will be commenced at once. E. A. Petroquin is president. Walker & Weeks, 1900 Euclid Ave., are architects.

Oregon

PORTLAND—The General Petroleum Co., Spalding Bldg., has awarded a contract to the Hord-Brook Co., Henry Bldg., for the construction of a new 1-story laboratory building on the St. Helens Rd.

Pennsylvania

EASTON—The Bath Portland Cement Co., Bath, Pa., has contracted with the Public Service Production Co., Public Service Terminal, Newark, N. J., to design and construct a new cement mill at Sandt's Eddy, about 6 miles from Easton, on site acquired a number of months ago. The plant will consist of a number of 1-story units, with electric power plant, machine shop and other mechanical buildings, and is estimated to cost $1,500,000, with machinery. It will be equipped for a capacity close to 80,000 bbl. per month, using electric-operated machinery in all departments. The contract with the Public Service Production Co., provides for the purchase and installation of all equipment by such organization.

PITTSBURGH—The National Tube Co., Frick Bldg., has plans for the construction of a 2-story and basement research and experimental laboratory, 55x100 ft., on Forbes St., near Morewood Ave., and will begin work at an early date. The company specializes in the manufacture of steel pipe, tubing, etc. Edward Stotz, Morongahela Bank Bldg., is architect.

PHILADELPHIA—Fire, Aug. 22, destroyed a portion of the plant of the Calbar Paint & Varnish Co., Torresdale Ave. and Worrell St., Frankford, with loss reported at $16,000. It is planned to rebuild.

Texas

GOOSE CREEK—The Humble Oil & Refining Co., Houston, Tex., has work in progress on extensions and improvements in its local plant for increased output for topping crude oil, to include the installation of a new battery of stills, cracking equipment, etc. The plant is located in the Baytown district, near Goose Creek.

DALLAS — The Daniels Chemical Proof Ink Co., recently organized, will operate a plant at 4625 Live Oak St., for the manufacture of special inks in powder, tablet and liquid form. It is expected to develop a large capacity. J. P. Daniels is president, and P. J. Demerath, vice-president and general manager.

Washington

CATHLAMET — The Crown - Willamette Paper Co., Pittock Block, Portland, Ore., is reported to be planning for the construction of a new mill in this section, consisting of pulp and paper units, with power house and other buildings. The estimated cost is placed at close to $500,000, including equipment.

New Companies

GILOOR MFG. CO., INC., New York, N. Y.; washing compounds, etc.; 500 shares of stock, no par value. Incorporators: F. L. Corbin and L. J. Gilroy. Representative: G. T. Hoar, 147 East 58th St., New York.

MOBILADE CORP., General Motors Bldg., Detroit, Mich.; lubricating and other oils; $50,000. Incorporators: Paul W. Stanley, Ralph C. Lightman and Viola Stanley, Graystone Apartment, Euclid Ave., Detroit.

UNION OIL CO., Union, S. C.; cottonseed oil products; $25,000. Incorporators: F. B. Kennedy and B. F. Alston, both of Union. The first noted will be president of the company.

CONNECTICUT VALLEY TALLOW CO., Holyoke, Mass.; tallow, greases, lubricants, etc.; $25,000. Samuel G. Wing is president; and Francis J. Mahoney, 453 Pleasant St., Holyoke, treasurer and representative.

ATLAS KING CHEMICAL WORKS, INC., Brooklyn, N. Y.; chemicals and chemical byproducts, textile dyes and bleaches; active capital $375,000. Incorporators: F. R. Ficken, C. W. and H. E. Zowdel. Representative: Hamilton & Stratman, 41 Park Row, New York.

KREGER GLASS CO., 1428 Walnut St., Kansas City, Mo.; glassware; $25,000. Incorporators: Benjamin Kruger and U. R. Meyers.

GRIMALDI ART TILE CO., Portland, Ore.; concrete and other tile products; nominal capital, $5,000. Incorporators: Vincent Grimaldi and Nathaniel Constanzo. Representative: James B. Finnigan, 414 Couch St., Portland.

A. J. STEVENS GREASE & OIL CO., 452 Broad St., Newark, N. J.; greases, lubricants, oils, etc.; $100,000. Incorporators: M. P. and A. J. Stevens, and H. H. Woolpert.

MIRACLE RUBBER CO., INC., New York, N. Y.; rubber products; 100 shares of stock, no par value. Incorporators: J. H. Broderick and T. Hansen. Representative: T. E. R. Beardsley, 55 Broadway, New York.

PLANTERS COTTON OIL CO., INC., Ennis, Tex.; cottonseed oil products; $300,000. Incorporators: J. O. and Homer N. Chapman, and Rush Hickman, all of Ennis.

KEEGAN LEATHER CO., Boston, Mass.; leather products; 1,000 shares of stock, no par value. Patrick Condon is president; and Dennis J. Gorman, 64 Williston Rd., Brookline, treasurer and representative.

PIONEER SILICA PRODUCTS CO., St. Louis, Mo.; operate silica properties, commercial reduction plants, etc.; $25,000. Incorporators: T. R. Reyburn, J. B. Bergs and A. H. Sullivan, Arcade Bldg., St. Louis.

MERRIMAC CHEMICAL CORP., New York, N. Y.; chemicals and chemical byproducts; $100,000. Incorporators: F. J. Davis, H. M. Hogan, and C. R. Caroll. Representative: J. T. Smith, 224 West 57th St., New York.

CAPITOL TIRE & RUBBER CO., Wilmington, Del., care of the Colonial Charter Co., Ford Bldg., Wilmington, representative; automobile tires and other rubber products; $100,000.

GRENCO OIL CO., INC., Greenwood, S. C.; refined oils, petroleum products; $25,000 Incorporators: W. T. Bailey, G. P. Sloan and H. L. Allen, all of Greenwood.

PHILIP J. MURRAY CO., INC., Belleville, N. J.; artificial leather products; $400,000. Incorporators: Charles J. Trelease, George B. Bailey and Philip J. Murray, 34 Mill St., Belleville. The last noted is representative.

EDGEWOOD CONCRETE PRODUCTS CO., INC., Springfield, Mass.; concrete and cement blocks, bricks, etc.; 50 shares of stock, no par value. David A. Reed is president and treasurer, 131 Edgewood Gardens, Springfield.

PLANO COTTON OIL CO., Dallas, Tex.; cottonseed oil products; $54,000. Incorporators: L. M. Levy and H. C. Dollahite, both of Dallas.

SHORNITE POWDER CO., INC., Portland, Ore.; powder and explosives; $50,000. Incorporators: C. C. Schorzman and W. R. Frentzel. Representative: Manning & Harvey, 714 Porter Bldg., Portland.

MILLER GLASS ENGINEERING CO., Swissvale, Pa.; glass products; $100,000. H. A. Cussack, Swissvale, is treasurer and representative.

AMERICAN SULPHUR MINES CORP., New York, N. Y., care of the United States Corporation Co., 65 Cedar St., New York, representative; operate sulphur properties for commercial production; $100,000.

FASIG CEMENT CO., Anna, Ill.; operate a cement mill; $250,000. Incorporators: Daniel H. Oskin, John C. McGinnis and Fred Magaw, all of Anna.

KLINGKOTE ENAMELING CO., 56 Broad St., Bloomfield, N. J.; enamels, paints, etc.; 2,500 shares of stock, no par value. Incorporators: J. Gordon Wilson, Henry Brady and Alfred C. Knapp.

PETEGEN CO., INC., Pittsburgh, Pa., care of the Corporation Service Co., Equitable Bldg., Wilmington, Del., representative; glass products, including stained glass, etc.; $50,000. Incorporators: M. Petegen, R. S. and Gerald L. Ley, all of Pittsburgh.

TWENTIETH CENTURY REFINING CO., Indianapolis, Ind.; refined petroleum products; $25,000. Incorporators: Arbon L. Darter, Fred C. Rapp and Charles Wishmier, all of Indianapolis.

ROCHMAN & JOYCE LEATHER CO., INC., Brockton, Mass.; operate a leather tannery; $18,000. John J. Joyce is president, and Samuel Rochman, 118 Warren Ave., Brockton, treasurer and representative.

Industrial Notes

THE SOUTHWARK FOUNDRY & MACHINE CO., Philadelphia, Pa., announces that Stewart Bolling, Jr., and H. D. Andress, formerly its representatives at 617 Swetland Bldg., Cleveland, Ohio, are no longer connected with the company and that the Cleveland office and its territory is now in charge of F. H. Smith.

THE CHEMICAL & VACUUM MACHINERY CO., INC., Buffalo, N. Y., has been incorporated to acquire the patents and all development of the research plant established by E. G. Rippel and his associate, Charles O. Lavett. The directors elected are J. F. Schoellkopf, Jr., William Schoellkopf, John Casa Eguia, Charles O. Lavett and E. G. Rippel. The officers elected are: E. G. Rippel, president; John Casa Eguia, vice-president; William Schoellkopf, secretary-treasurer, and Charles O. Lavett, manager. The company will market a modern and improved line of apparatus for the manufacture of chemicals, electrochemical products, dyes, pharmaceuticals, food and food byproducts recovery apparatus, explosives, acids, extracts, etc.; also special apparatus for the manufacture of milk powder, evaporated or condensed milk and other milk products.

THE CONSOLIDATED PRODUCTS CO., INC., 15 Park Row, New York, one of the largest dealers of used equipment in the country, has purchased outright the American Hominy Co.'s plant at Indianapolis, Ind., including all equipment and real estate. The plant is one of the largest and best equipped of its kind in the country, with a total floor space of more than 200,000 sq.ft. and has a very advantageous location with the most modern facilities for storing and shipping, and facilities for obtaining 15,000,000 gal. of water daily. The manufacturing equipment is of the latest type and includes a complete power plant composed of a total boiler capacity of 2,500 hp. with two large generators, one of 1,000 kva. and the other 600 kw., a complete sirup and oil plant that includes twenty-nine Anderson expellers and cookers, and a complete milling plant.